THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 26 NEW YORK, JUNE, 1928 No. 6

Electroplaters' Convention Will Be Held in Toronto

Description of Toronto, Canada, Complete Program and All Other Information Necessary for Visitors at the Convention of the American Electroplaters' Society, June 25-28, 1928

By WALTER S. BARROWS
Secretary, Convention Committee, American Electroplaters' Society, Toronto, Canada

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Convention week is now regarded by hundreds of electroplaters, plant executives and platers' supply house representatives, as the bright spot in the year, when, for four brief days, chromium fumes, rush orders and specifications cease to be included in the daily bill of fare. The foreman plater closes his desk, imparts necessary instructions to his assistant and prepares to attend the big annual gathering with observing eyes, attentive ears, a kindly tongue and a receptive mind. In his pocket, guarded as carefully as his money or watch, is a list of problems, in which he is particularly interested, or a memo relative to specific questions he intends to ask some other plater. The plant manager, superintendent or purchasing agent anticipates requirements of equipment or supplies and expedites satisfactory selection and purchase by interviewing several manufacturers' representatives at their exhibition booths during the hours between educational sessions. The supply man, always keenly interested in possible future needs of electroplaters and metal finishers, eagerly and attentively listens to reading of papers and subsequent discussions, obtaining therefrom, a fund of useful information and a better acquaintance with the trend of opinions respecting methods necessitating use of his particular class of goods. Mother, wife or daughter attend the Convention because of the pleasure afforded by the trip to and fro, the happy renewal of acquaintances,

THE ELECTROPLATERS WILL VISIT NIAGARA FALLS, USING THE "CAYUGA" FOR THE TRIP TO LEWISTON. THE BOAT STARTS FROM THE DOCKS SHOWN IN THE LOWER PICTURE

the enjoyment of special features provided for the ladies and the vast amount of benefit to be derived from a "little change from the routine of everyday domestic affairs."

HISTORY OF TORONTO

Naturally, every city boasts of some feature which is intended to function as a potential magnet. Its location, surroundings, industries, progressiveness, climate, architecture of buildings, hospitality, etc., serve to attract, interest and enthuse goodly numbers each year.

Toronto, the "Queen City" of the Dominion of Canada, will be the place of meeting for the American Electro-Platers' Society this year, on June 25, 26, 27 and 28. When the unprecedented popularity of this charming city

CITY HALL, TORONTO, ONT.

for the purpose of convention is taken into consideration, the success of the 1928 annual gathering is beyond the shadow of a doubt. From an historical and descriptive sketch of Toronto, written by David Reid Keys, M.A., we quote the following reference:

"It appears that from far distant ages the neighborhood of Toronto was distinguished as the embouchure of a great river from the Northland, discharging the waters of vast inland seas of that early era into a lake which was much larger than the present Ontario. Had this river remained to our time, Toronto might have been already a second Chicago. But the oldest records say that the site was a well-known Indian trading-post and center of exchange, one of the most popular etymologies for the name being "a place of meeting," and a place of meetings, Toronto has certainly been. The first references to Toronto quoted by Dr. Scadding in his delightful volume of "Collections and Recollections" is found in a memoir on the state of affairs in Canada, transmitted to France in 1686 by the Governor of the day, the Marquis de Denonville. Referring to preparations for meeting the hostile advance of the English, he writes to the minister de Seigneley: "M. de la Durantaye is collecting people to entrench himself at Michilimaquina and to occupy the other pass which the English may take by Toronto, the other entrance to Lake Huron. In this way our Englishmen will have somebody to speak to. All this cannot be accomplished without considerable expense, but we must maintain our honor and our prosperity."

By the middle of the next century (A. D. 1749) a stockade was erected and a trading post established at Toronto. . . . The new French Fort was named Fort Rouille, after the Colonial minister, and was visited soon after its foundation by the famous "apostle of the Iroquois," The Abbe Picquet. "The Journals of Major Robert Rogers," which were published in London, A. D. 1765, give an account of the visit he paid to Toronto in September, 1760, in the course of an expedition to take possession of Detroit. After describing the joyful reception and important information which Indians had given him, he continues: "I think Toronto a most convenient place for a factory, and that from thence we may easily settle the north side of Lake Erie." In its early acceptation the name Toronto was applied to all the district lying north as far as Lake Simcoe, and it was also used for that Lake on Eighteenth century maps. During the revolutionary war it was happy in having no history, but at the conclusion of the conflict the influx of Loyalists began. Major General Simcoe, who fought under Lord Cornwallis, was appointed Lieutenant-Governor of the new province of Upper Canada, created under the constitutional act of 1791. Under his administration Toronto was first laid out in 1794 on its present site by Surveyor-General Bouchette. At this date also, Yonge Street was planned as a road to Georgian Bay and named after Sir George Yonge, then Secretary of War. The town itself was christened York, in honor of the soldier-son of George III.

"Toronto was incorporated as a city in 1834. The early settlers came mostly from the south, including the "Pennsylvania Dutch," of whom a number took up land to the north and east of Toronto. The first Toronto "boom" broke after the Crimean War in 1857. The successive hill-plateaus which mark the earlier shore lines of Lake Ontario formed boundaries to the north, and the city expanded east and west along the lake front. But in later years when the electric trolley climbed the bluff known to geologists as the "Iroquois shore," less than three miles north of the bay, the development of this lofty

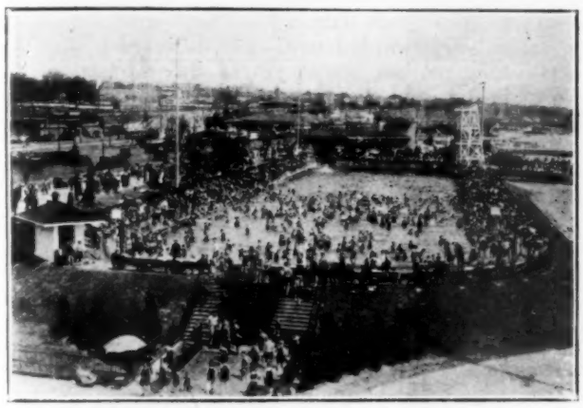
KING EDWARD HOTEL—CONVENTION HEADQUARTERS

and healthy district began, and within three years became the most fashionable part of the city. The old English hall, the Norman-French chateau, the Italianate mansion, and the medieval castle are all to be found surrounded by grounds so spacious that there is no sense of incongruity produced by the different styles. Casa Loma, built by Sir Henry Pellatt, with its adjacent stables and gardens, was until recently one of the most magnificent residences on the continent.

TORONTO AS AN INDUSTRIAL CENTER

The following is abstracted from Official Confederation Program issued by authority of City of Toronto:

"Vessels with a cargo billed to Toronto are always assured of a ninety per cent return cargo. The Eastern Harbor Terminals comprises 681 acres of industrial sites, 11 acres of public docks and 132 acres of streets and railway reservations. Thirty-three industries are now located in this district with plants and buildings estimated at $8,000,000. The Central Harbor Terminals extends a distance of two-and-a-half miles across the entire front of the Inner Harbor. One single storage warehouse cost $3,000,000 and is the largest single unit terminal warehouse in America. It contains 1,000,000 square feet of space. The Canada Steamship Lines Limited freight and passenger Terminals cost $1,750,000. Crosse & Blackwell Limited of London, England, and Loblaws Groceterias Limited have buildings, the total cost of which will approximate $1,000,000. Thirteen industries located in this district have plants and buildings of a value estimated to be $6,500,000. The Western Harbor improve-



WORLD'S LARGEST HEATED SWIMMING POOL

ments include Sunnyside Beach, situated near the westerly extremity of the waterfront, and beyond "Old Fort Rouille," which is one of the city's most cherished landmarks. An apt modern interpretation of the name "Toronto" derived from the Indian De-on-do, has been adopted as the city's slogan—"Toronto—the Logical Location."

Toronto has a charm of character that is unique in a city of this continent. Civic pride and civic loyalty are also notable characteristics of Toronto, and they have given expression in public ownership and operation of nearly all public utilities. Waterworks, street cars, power and light supply, harbors, schools, parks and other important public services are owned by the people and operated for them either as departments of the civic government or by commissions, composed of prominent citizens who give generously of their time to public service.

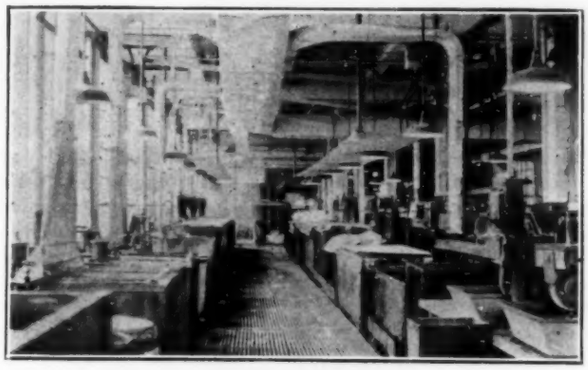
The University of Toronto was chartered in 1827 as King's College, but was not opened for students until 1843. It received its present name in 1849. In the nine faculties there is an enrollment of approximately 5,500 students. There are four Art Colleges, University College, Victoria College, Trinity College and St. Michael's College, also two federated colleges, Knox and Wycliffe. The University of Toronto is by far the largest University in Canada and is probably the second or third in size of the English-speaking Universities of the British Empire. The Royal Ontario Museums of Archaeology, Geology, Mineralogy, Palaeontology and Zoology, all housed in one building, are maintained by the University of Toronto in co-operation with the Government of Ontario. The University Library contains over 200,000 volumes. In the Provincial University of Ontario, research receives a great deal of attention. The Central Technical School, corner Lippincott and Harbor streets, is the finest trade school in Canada, erected and equipped at a cost of $2,500,000. Here the members of Toronto Branch, American Electroplaters' Society have met each week during winter months to study the theoretical and practical problems of the electro-deposition of metals under the able tutorship of J. A. Magill, an active member of Toronto Branch.

HISTORY OF ELECTROPLATING IN TORONTO

To N. F. Gundy, President and Managing Director of McGlashan Clarke Company, Ltd., Niagara Falls, Canada, who has been engaged in the manufacture of silverware for nearly fifty years, we are indebted for the following interesting resume of the silverplating industry in Toronto and vicinity:

"My earliest recollections of the silver plating industry in Toronto are with reference to one of the first attempts made to manufacture silver plated flatware in Canada. This was in 1877 and by the Electric & Hardware Company, on King street, West. I left the office to become "an indentured apprentice in the art and science of gold and silver plating," for a period of three years, starting at three dollars per week, for the first year. The plating room was in charge of Charles Elkington—one of the founders of the well-known firm of Elkingtons, Birmingham, England, and who had charge of his firm's electroplating plant in 1840, when the cyanide process was first developed. Mr. Elkington sold his interest in the firm of Elkingtons years later, and with what was considered a fortune at that time, arrived in New York City, U. S. A. His first enterprise in America did not prove to be a prosperous venture and finally failed. Mr. and Mrs. Elkington then came to Toronto, their small fortune having been entirely lost.

Charles Elkington was a gentleman of the old school. I recall with pleasure my experience under his tuition.



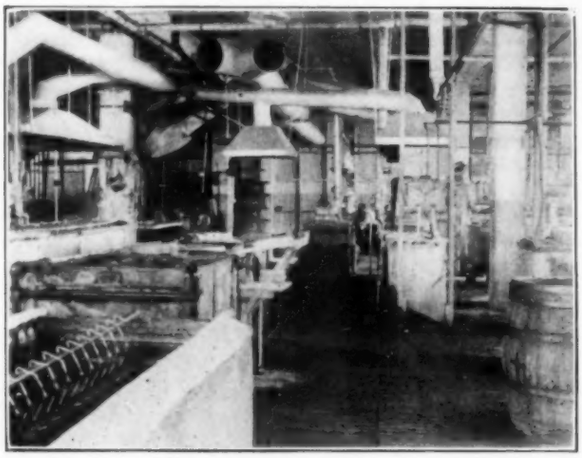
SILVER PLATING DEPARTMENT, ONEIDA COMMUNITY, NIAGARA FALLS, CANADA

One incident is particularly prominent in my memory. One Monday morning Mr. Elkington came in the shop with a snake in one pocket and a toad in another pocket. These creatures were killed with a stick the day previous in High Park. He coated the specimens with lamp black and, after careful preparations, he copper plated them in a copper sulphate solution and eventually completed the finish in a Green Gold plating bath. He delighted in metalizing flowers, leaves, etc., in the same manner, making perfect specimens in metal.

Mr. Elkington left the Electric & Hardware Company to do experimental work in Galvanoplasty for the Normal School. His successor in the plating shop was John Rogers, who came here from the Gorham Company,

Providence, Rhode Island. Our employers failed in business the following year and in 1881 Mr. Rogers returned to the Gorham Company and at his request I went to Providence, where he gave me all his gold and silver plating receipts for the sum of $75. These are still in my possession. They were real secrets in those days and carefully guarded.

One of the oldest and best known electroplaters in Toronto prior to his death a few years ago was H. J. Dorrien, who conducted a plating business on King street, West, for many years. His obituary, published at the



PLATING DEPARTMENT, CANADA CYCLE AND MOTOR COMPANY, LTD., WESTON, ONT.

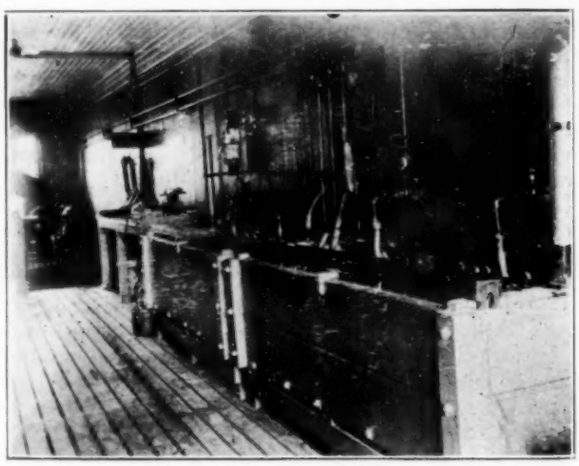
time of his demise included the following references to his career—"Mr. Dorrien was a pioneer in the electroplating industry of Toronto and was honored by the distinction of having established the first electroplating factory in the Dominion. He was born in Gloucester, England, and came to Canada in 1871. He retired from business in 1919." Mr. Dorrien died at the ripe old age of eighty-eight. Another pioneer was W. J. Millichamp, who operated a show-case factory and plating shop on Adelaide street.

About 1879 the Meriden Britannia Company of Meriden, Conn., began the manufacture of silver plated ware in Hamilton, Ontario. They are still going strong under the management of J. W. Millard. They were followed two years later by the Toronto Silver Plate Company, in Toronto (now the Canadian William A. Rogers). James A. Watts, formerly a traveller for the Meriden Britannia Company, was instrumental in founding this company and successfuly managed the business for many years. He was succeeded by Edward Gooderham. They in turn sold out to the William A. Rogers, of New York, U. S. A. A. J. Parker, who started the Electric & Hardware Company in the manufacture of silverware, was another outstanding personage of that period. After failure of the Electric & Hardware Company as previously stated, Mr. Parker opened a Branch of the Meriden Silver Plate Company, of Meriden, Conn., in opposition to the Meriden Britannia Company of Hamilton. This business was eventually absorbed by the Meriden Britannia Company, of Hamilton, in 1884, and A. J. Parker started the Standard Silver Company and located on Hayter street. This company was also taken over by the Meriden Company. Mr. Parker finally left Toronto and located in South Africa, where he died several years ago.

The Oneida Community came over to Canada about 1910 and have at Niagara Falls a factory that for architecture stands alone in the silverware industry.

The history of the Ontario Silver Company, another firm whose origin dates back to the early eighties is interesting. The company was started in Humberstone by Dr. Clarke of Niagara Falls, N. Y., and Leonard McGlashan. Humberstone was chosen as the logical location because natural gas was plentiful there. The gas supply soon became exhausted and the business was moved to River Drive, Niagara Falls, Canada, and a very successful cutlery and flatware business was built up. Mr. McGlashan founded a company of same name in Muncie, Indiana, which Ned Clarke, son of Dr. Clarke, managed until his death ten years ago. Mr. McGlashan sold out to the Meriden Britannia Company in 1905, on account of his ill health and his death occurred the following year. In 1906 his son, Lee, together with Ned Clarke of Muncie, built the present factory at Niagara Falls, Canada. McGlashan-Clarke Company, Ltd., known from coast to coast as the pioneer manufacturers of stainless steel cutlery, have met with great success in the manufacture of high grade flatware for hotels and restaurants, and have been awarded many of the largest hotel contracts during the last twenty years. Lee McGlashan died two years ago and was succeeded in the presidency by N. F. Gundy, who has since the inception of the company sold the output of the factory and as vice-president taken an active part in the management. His experience gained during the early years in the plating room, combined with twenty-five years of selling experience for the Meriden Britannia Company, has helped to bring this company to its present unique position. The third generation, in the person of a son of the founder, Leonard McGlashan, is now learning his trade in the plating room of the company."

William McCann, a veteran in the plating business is proprietor of the McCann Plating Company, 114-116 Jarvis street, Toronto. "Billy" is highly esteemed by all



NICKEL PLATING TANK AT THE CANADIAN AUTO KNITTER HOSIERY COMPANY, TORONTO, ONT.

who know him and carries his years with wonderful grace. His plating career began about 1880 with the Meriden Britannia Company, Hamilton. He was in charge of the King Edward Hotel silversmithing, and the plating plant for many years. Several years ago he opened a shop under his own name and has built up a job plating and silversmithing business which is second to none in Toronto.

Probably the most widely known veteran in the plating industry of Toronto is W. W. Wells. He opened a job plating shop about 1885 and in 1891 went into the supply business, representing the Zucker and Leavitt Chemical

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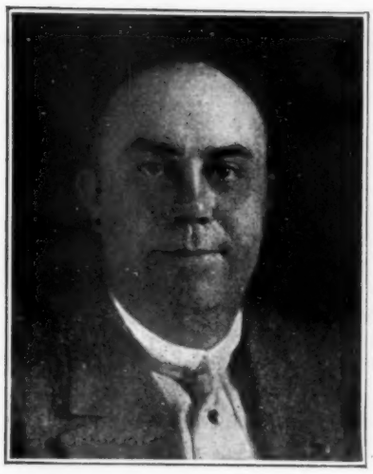

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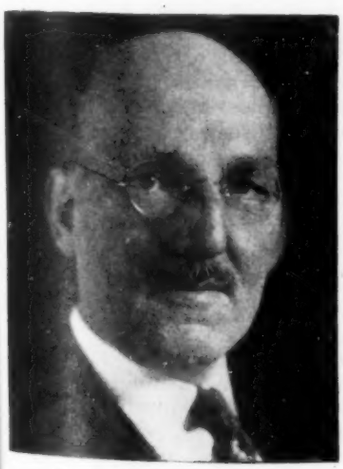

GEORGE B. HOGABOOM,
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Vice-President

Company, 40 Murray street, New York, with his headquarters at 35 Adelaide street, W., and later moved to the Truth Building. Subsequently, Mr. Wells launched into the platers' supply business for himself and has since catered to a very large portion of the Canadian trade. Interviewed by the writer, Mr. Wells recalled the following with regard to Toronto platers and methods employed during the earlier days. H. J. Dorrien ran the first job plating shop in Toronto. He came from New York, U. S. A., to install a plating plant for the Gurney Foundry. Principal objects plated were urns for hotels, curling stone handles, harness trimmings, carriage lamps, etc. Chris Rheder was the plater. The Gurney Company were the first manufacturers in Toronto to equip a department for plating its product. There was also a spring skate factory in a lane on the east side of the present Royal Bank site at King and Yonge streets. The Wanzer Sewing Machine Company operated the first plating plant in Hamilton, with Gay Feldman as the plater. The Wyness Plating Company was the second job plating shop to open in Toronto. They were located at about 205 Yonge street, Jim Attley was the plater and silver plating was the leading line. Charles Stark & Company had a wholesale jewelry establishment on Church street near Court street and did gold and silver plating. Acme Silver Company, later absorbed by the Standard Silver Company, were then in Church-Jarvis district, south of King street. The Gendron Manufacturing Company were doing electroplating in the eighties, on Wellington street. William Miller was the plater.

The Booth-Coulter Copper Company were then on York street. The firm is now the Coulter Cooper and Brass Company, located on Sumach street. They were leaders in their line in the old days and now have the largest job plating plant in Toronto. William Durand was the plater during the pioneer days. Samuel Findlay has been foreman for many years. They operate copper, brass, nickel, cadmium, silver and chromium baths, on brass castings, auto trimmings, etc., and manufacture equipment for sugar refineries, starch works and breweries. The plating, polishing and buffing departments employ about 100 men. This plant is the only one in Canada equipped to polish and plate copper sheets.

Referring to methods, equipment, etc., Mr. Wells recollects many conditions which prevailed in the early eighties. The Weston water cooled dynamo was employed. Reversal of polarity was a frequent occurrence and a galvanometer was necessary equipment to enable the plater to determine in which direction electrical current was flowing. This instrument was even more essential in those days than a voltmeter is today. When reversal occurred, terminal wires were changed at the machine and all was well until next reversal. No double throw switches were used and equipment was as simple as possible to work with. All plating baths were cold. About 1890, equipment and practice began to show considerable improvement. Crocus, which had been used for buffing nickel, was discarded for a form of Vienna lime. Dynamos were obtainable which did not change their polarity so easily as machines previously used, although they would frequently and suddenly cease to generate the usual current. A piece of steel was allowed to adhere to the frame, which was magnetized. When the piece dropped off it indicated lowering voltage. In the eighties flat cast nickel anodes were obtainable, "about 50-50, nickel and something else," no specifications about metal content until about 1892. The anodes were usually bagged, some hard as flint, and instances are known where nickel anodes endured for fifteen years. An 8 ft. x 3 ft. x 8 ft. tank would usually contain three flat anodes. A very good grade of nickel salts was procurable then and constituted the principal source of metal supply for the baths.

Chris. Rehder, proprietor of the Bowmanville Foundry is another veteran of the plating business still in active service. Born in Denmark in 1854, Mr. Rehder came to Canada during his early childhood and his first experience in plating was with the D. Moore Company, stove founders, in Hamilton, Ontario, in 1879. He soon learned to determine change of polarity of the dynamo by change of sound. Double salts only were used. No other addition made to bath except liquid ammonia. Nickel anodes were placed in frames similar to slate frames to hold them together, as they were easily broken. These anodes were imported.

Some anodes obtained in Europe lasted four years and were finally melted down. Nickeling was done direct on the cast iron, as is the practice now. Block and paper wheels were used for polishing. The polisher bought his cotton and made his own buffs. Vienna Lime came in five gallon cans, ground, but not slacked. Nickel was washed in caustic and turned brown color in short time. Then a composition was used which eventually caused a blue discoloration on nickel. Finally "Ash Man's Soap" was employed. This consisted of 25 parts sal soda, 7 parts rosin and 7 parts tallow, boiled until digested. Mr. Rehder still uses this in his plant. Boys were employed for brief periods only, during these days, for fear they would learn something of the methods. The boss would go to the shop at night and fix the solutions or do anything he did not want the boys to get wise to. There was no more trouble with cleaning then than now, but production was small and there was less hurry. Plating literature was exceedingly scarce and of little value to the plater, information cost money, none dispensed free. The "Art of Plating" was a secret. Mr. Rehder states that H. J. Dorrien did close plating on carriage and harness trimmings. The greater part of nickel plating was on stoves, and batteries were employed more than dynamos.

Hamilton, Ontario, was the stove center of this country at that time. Today there are no stoves made there. E. & G. Gurney Company operated first plating plant in Hamilton. After Mr. Rehder left D. Moore & Company he was employed by the Gurney Company. A shoemaker took charge of the Moore shop and as he had seen ammonia used, he resorted to its use frequently until the work required turning end for end repeatedly in order to get both ends plated, and the solution was finally thrown out.

Other well-known platers in Toronto during the early days were Adam Dermody, gilder; Jack Nelson, nickel-plater; Mr. Paris, Mr. Hale, Joe Fluke, famous as a silver plater. In Robertson's "Landmarks of Toronto" (pages 329-330) in a street key of King street, from a directory of 1846—appears the names of J. E. Pelk, gilder, and W. B. Dolmage, gilder. No further references to these names have been discovered by the compiler of this article.

MODERN PLATING PLANTS

The more or less gradual development of general plating methods as in vogue today in Toronto, partakes more of United States ideas than European ideas. Toronto electro-platers are studious, up-to-date and progressive. Their electro-plating ranks second to none and the average plant is well equipped to produce high grade work. Some of the Toronto firms operating plating plants are: Standard Sanitary Manufacturing Company, bathroom fittings, etc., Joseph Ellis, foreman plater; Auto Strop Safety Razor Company, safety razors, Benjamin Deakin, foreman plater; Canadian, William A. Rogers, Ltd.

makers of heirloom plate, Harry Cresswell, foreman plater; Dale Wax Figure Works, show window fixtures, etc., William Cuming, foreman plater; W. H. Dunne, roller and ice skates, James Cairns, foreman plater; Moffats, Ltd., electric stoves and heaters, Charles Beltz, foreman plater; Standard Silver Company, hollow and flatware, Thomas O'Keefe, foreman plater; Coulter Copper & Brass Company, plant equipment and castings, general jobbing, Samuel Findlay, foreman plater; Fletcher Manufacturing Company, soda fountain fittings, John Young, foreman plater; A. Schrader's Son, Inc., tire valves, etc., William Enscott, foreman plater; Benjamin Electric Manufacturing Company of Canada, Ltd., electric lamp sockets, etc., Danniel Stiff, foreman plater; W. H. Banfield & Sons, electrical devices and fixtures, C. G. Colwill, foreman plater; M. Langmuir, Manufacturing Company, Ltd., trunks, etc., E. Coles, foreman plater; International Business Machines Company, Limited, scales, recording and tabulating devices, J. H. Collins, foreman plater; Metropolitan Motors Limited, general job plating, Martin Phillips, foreman plater; Canada Cycle Motor Company, Ltd., Weston, Ont., Walter S. Barrows, foreman plater.

The Toronto Convention Committee has not arranged a schedule for shop visits as it was considered advisable to utilize the time otherwise. Furthermore, there are no shops in Toronto which possess outstanding features of importance to platers in general. Delegates desiring to visit plating plants will be advised and assisted by the information committee. Ask "Billy" Wells, Jr. Several firms extend a cordial invitation to all. (See Souvenir Program.) Even the average Toronto plating plant is capably operated.

DRIVING INTO CANADA

Entering Canada with a motor car does not inconvenience the motorist. Entry and departure may be at different ports, but the return route should be known prior to entry. License card is retained by immigration officer at port of entry, unless departure is to be by a different port, in which case a duplicate card system is employed. The aforesaid applies to persons entering Canada by motor car, intending to remain three months or less. Delay occasioned by inspection should not exceed ten minutes. Necessary personal baggage enters Canada duty free. Goods of commercial value, such as samples, advertising novelties, or articles for sale or general free distribution, are subject to duty and must be declared. The requirements of delegates and visitors attending this convention shou'd not be such as to cause them the slightest difficulty at the border. Simply pack your grip and travel, speak the truth when questioned by the immigration officer and you will scarcely realize you are crossing the international boundary line. The roads from Niagara Falls to Toronto are splendid, scenery enjoyable and historic.

The St. James Garage, corner Church and Lombard streets, quote special rates for A. E. S. delegates and visitors; 75c per night up to 10 o'clock following morning; $1.00 for twenty-four hours. The St. James is of Ramp construction and convenient to convention headquarters. For other garages throughout the downtown district, ask Billy. Luxurious motor coaches leave Buffalo (Pearl and Court streets) daily for Toronto, fare round trip $6.50. All roads in Ontario, leading to Toronto are now in good condition.

SHIPPING EXHIBITS INTO CANADA

Platers desiring to enter plated goods in the prize award contest for exhibits, should address packages to American Electroplaters' Convention, King Edward Hotel, Toronto, Canada, in care of Burton E. Field, Customs Broker, 44 Yonge street. Ship by express. Do not carry. Such shipments should arrive not later than

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Second Vice-President

Friday, June 22, in order to allow the customs broker ample time. All goods for exhibition purposes should be addressed as above, whether from supply houses or individual platers and will enter Canada in bond and must be returned to the United States or duty paid. John Walker, Chairman of the Exhibition Committee and his associates will do everything possible to assist exhibitors. Exhibitors may arrange exhibits on Saturday, June 23. Platers intending to exhibit plated goods should write now for necessary forms. We will forward these promptly. They are simple to fill in.

CHARLES H. PROCTER,
Founder of the A. E. S.

HOTELS AND RATES

King Edward Hotel—27 King Street, East
Single—With bath $4.00 to $8.00 per day.
Double—With bath $7.00 to $12.00 per day.

Prince George Hotel—King and York Streets.
Single—Without bath, $2.50 up.
With bath, $3.50 up.
Double — Without bath, $5.00.
With bath and double bed, $6.00.
With bath and twin beds, $7.00.

Walker House — Front and York Streets.
Single—With bath $3.50 and $4.00. Double—With bath, $6.00 and $7.00.

Carlsrite Hotel—Front and Simcoe Streets.
Single—$3.50 up with bath.
Double—$7.00 to $9.00 with bath.

Victoria Hotel—58 Yonge Street.
Single—$2.50 to $3.00.
Double—$5.00 to $6.00.

Iroquois Hotel—141-147 King Street, West.
Single—$1.75 to $2.50.
Double—$3.50 to $5.00.

New Ford Hotel—601 Bay Street, 750 rooms.
Single—Hot and cold water, $1.50.
Double—Hot and cold water, $2.50.
Single—Shower and toilet, $2.00 to $2.50.
Double—Shower and toilet, $3.00 to $3.50.

American Hotel—106 King Street, West.
Single—$3.00 with bath.
Double—4.00 with bath.

Marlborough Hotel—214 Jarvis Street.
Single—$1.50 without bath.
Double—$2.00 with bath.

Florence Hotel—30 King Street, West.
Single—$1.50 and $2.00, bath on same floor.
Double—$3.00 and $4.00, bath on same floor.

If you manage to fill these up we will find others to care for you.

PLAN OF CONVENTION

All educational and business sessions will be held in the Pompeian Room, mezzanine floor.

Exhibits will be almost directly across the hall from the convention room.

Registration and reception, same floor. You cannot miss it. Plan to reach Toronto, Sunday, June 24, register early and attend promptly the opening of each session. This co-operation on your part will greatly assist the Supreme Officers and the Convention Committee. A list of all registrants will be posted in the lobby. Consult it if you want to know who is present.

OFFICIAL PROGRAM

MONDAY, JUNE 25, 1928

8:00 A. M.—Registration.
9:00 A. M.—Meeting of the Executive Board.
9:30 A. M.—Meeting of Credential Committee.
10:00 A. M.—Convention called to order by Chairman of Committee—John Acheson, Toronto, Can.
Address by President John Walker.
Address by Mayor Samuel McBride.
Response by Past President F. C. Mesle.
Address of Charles H. Proctor, Founder of A. E. S.
Address by Supreme President J. H. Feeley.
Convention opened for business.
Minutes of last regular meeting.
Reports of officers.
Appointing of committees by Supreme President.
Presentations and Reading of Resolutions.

2:00 P. M., Reading of Papers and Discussions, Supreme President John H. Feeley, presiding.

(1) **W. J. Schneider**—American Methods of Cadmium Plating.

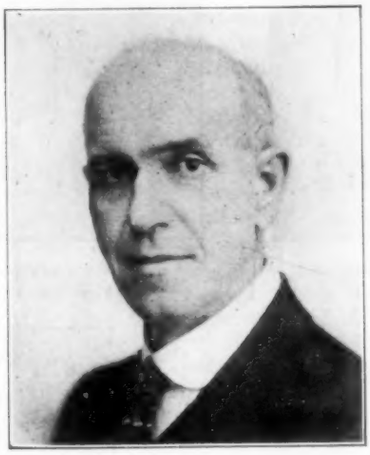
(2) **Dr. W. Blum**—Summary of Research Work on Plating.

(3) **Joseph Triska**—Immersion or Dip Gilding on Brass Jewelry and Novelties, in a Red or 14 Karat Gold Shade.

(4) **Harold Work**—Nickel Plating Aluminum.

8:00 P. M.—(1) **F. J. Liscomb,** Chicago, Ill., Unwritten Work in Electro Plated Problems. (Illustrated.)

(2) **Dr. J. T. Burt-Gerrans,** Associate Professor of Electro-Chemistry, University of Toronto, Control of Acidity in Nickel Baths. (Illustrated.)



W. S. BARROWS
Past President of the A. E. S., and Secretary of the 1928 Convention Committee.

(3) **Prof. W. H. Price,** of the Faculty of Applied Science and Engineering, University of Toronto, The Low Voltage Generator. (Illustrated.)

(4) **Walter J. Allen,** Grand Rapids Branch, Evolution of Plating.

TUESDAY,
JUNE 26, 1928

9:00 A. M.—(1) **Mr. Van Straaten,** International Chemical Company, Philadelphia, Pa., The Plater's Position in Purchasing.

(2) **W. P. Barrows,** Bureau of Standards, Washington, D. C., Spotting Out of Sulphide Finishes.

(3) **Dr. J. G. Cunningham,** Director Department of Industrial Sanitation, Province of Ontario, Health Hazards in the Electroplating Shop.

(4) **Leo Roon,** Technical Director, Roxalin Flexible Lacquer Company, Long Island City, N. Y., New Thoughts and Their Application in the Lacquer Industry.

(5) **Thomas A. Gardner,** New York Branch, The Finishing of Metals in Odd Colors.

1:30 P. M.—Board Buses for Steamer Dock.

2:15 P. M.—Leave Toronto on Steamer Cayuga.
5:00 P. M.—Arrive at Lewiston, N. Y.
6:00 P. M.—Arrive Niagara Falls, N. Y., via Gorge Route. (Keep your seats and cross bridge on same car.)
6:15 P. M.—Leave cars and assemble promptly for official photograph, Queen Victoria Park.
6:30 P. M.—Dinner at Refectory, Queen Victoria Park, Niagara Falls, Ont.
7:30 P. M.—Ball game. Between the Best and the Rest. The Oneida Community, Ltd., cordially invite all delegates and visitors to visit their factory between 7 and 9 P. M.
9:00 P. M.—View the Falls illuminated.
10:30 P. M.—Leave Niagara Falls (board cars at refectory).
11:00 P. M.—Arrive Queenston, via International Railway. All get aboard steamer Corona. Please make it snappy.
1:30 A. M.—Arrive Toronto, Canada, for a wee snooze. Buses will meet boat at Toronto wharf and convey our guests to Convention Headquarters.

WEDNESDAY, JUNE 27, 1928

9:00 A. M.—(1) **David Ayers,** Toronto Branch, The Mechanical Plating Barrel.
(2) **F. C. Mesle,** Oneida Community, Ltd., Oneida, N. Y., Silver Plating.
(3) **W. E. Hughes**, England, Author Modern Electroplating, The Plater and Research.
(4) **W. W. Patrick,** Foxboro Company, Inc., New York City, Temperature Control.
(5) **Charles Dunn** and **Joseph Beloin,** Hartford-Conn. Valley Branch, The Silver Plating of Cutlery.
(6) **E. M. Andrews, E. M. Stephenson** and **H. R. MacFadden,** Hartford-Connecticut Valley Branch, Special Finishes.
2:00 P. M.—(1) **Dr. A. K. Graham,** Chemical Engineer, Hanson-VanWinkle-Munning Company, Matawan, N. J., What Happens at Anode and Cathode.
(2) **Kenneth E. Burgess**, Superintendent, Zapon Lacquer Company, Stamford, Conn., The Story of Lacquers.
(3) **James Welsby,** Dartmouth, Nova Scotia, Cadmium Versus Zinc.
(4) **Oliver J. Sizelove,** Newark Branch, Chromium Experiments.
(5) **Charles H. Proctor,** Founder of A. E. S., Chromium Plating—Its Present and Future.
(6) **B. F. Lewis,** Detroit Branch, Chromium Plating Die Cast Metal.
(7) **C. Van Derau,** supervisor of finishes, Westinghouse Electric Products Company, Mansfield, Ohio, Engineering of Chromium Plating.
(8) **S. T. Lunbeck,** Philadelphia Branch, Some Experiences with Chromium Plating.
7 P. M.—Annual Banquet.

THURSDAY, JUNE 28, 1928

9:00 A. M.—Business Session.
Report of Committees.
Election of Officers.
Selection of Convention City for 1929.
Installation of officers.

THURSDAY AFTERNOON, JUNE 28, 1928

1:30 P. M.—Sightseeing Tour of Toronto.
See the Capitol City of the Province of Ontario from a luxurious Toronto Transportation Commission Motor Coach.

A Special Program consisting of Card and Theatre parties, luncheons and shopping tour has been arranged for the ladies; all events for afternoons and evenings.

EXHIBITORS

Frederic B. Stevens & Company, Detroit, Michigan.
National Steel Products Company, Dayton, Ohio.
Canadian Hanson-Van Winkle Company, Toronto, Ontario.
J. B. Ford Company, Wyandotte, Michigan.
Oakite Products, New York.
International Chemical Company, Philadelphia, Pa.
Apothecaries Hall Company, Waterbury, Conn.
THE METAL INDUSTRY, New York, N. Y.
BRASS WORLD, New York, N. Y.
Other exhibits are now under consideration.

Camels are unknown in Toronto. We have fish, chickens, and a few lobsters, but no crabs.

INTERNATIONAL FELLOWSHIP CLUB MEETING

Due to the trip to Niagara Falls on June 26th, the International Fellowship Club luncheon will be held on June 27th, at the King Edward Hotel.

EQUIPMENT ASSOCIATION MEETING

A meeting of the Metal Finishers Equipment and Material Association will be held at 10 A. M. on Monday, June 25th at the King Edward Hotel.

Brass Working in India

Tattered workers of India, in mud-thatched huts, produce with the crudest of tools many graceful brass and copper vases, bowls and images.

Certain types of the ware are produced all over India; each section has its own style. Burma leans toward the production of enormous brass figures, cast in foundries almost utterly lacking in equipment.

Benares is perhaps the first city of India for the multitude and excellence of its cast and sculptured images and for ceremonial utensils of brass and copper. In Central India several cities, the most important of which are Jaipur, Bikaneer and Indore, are noted for their craftsmanship. Jaipur specializes in polished brasses; Bombay is noted for its work in copper.

The style of Madura and Tranjore is of elaborately inwrought design, with bold form.—NEW YORK TIMES.

Tinning Strengthens Seams in Copper

The results of tensile tests of lap and flat lock seams in copper roofing indicate that neither the direction of rolling of the copper nor the kind of flux used to make the seams have any relation to the strength of seams possible to produce, according to report of the research associate of the Copper and Brass Research Association, who performed his tests at the Bureau of Standards, Washington, D. C. Only minor effects resulted from variations in the thickness of the copper or the amount of solder applied.

It is stated that pre-tinning the edges of the copper sheets, however, resulted in a remarkable increase in the strength of flat lock seams. Pre-tinning with tin or with solder was equally effective. Three-quarter inch lap seams and half-inch flat rock seams, pre-tinned, were found to be as strong as copper sheets of 20 gauge.

Cadmium Plating in Quantity Production

Its Value as a Protection Against Rust—A Description of Methods of Plating—Means of Control — Analysis of Cadmium Plating Solutions

By C. H. LOVEN
Chemist, The Bassick Company, Bridgeport, Conn.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Cadmium plating in the finishing industry is being more often employed as a finish and protective coating for automotive and other parts of a like nature. When properly applied, it has several times the protective value of either nickel or zinc plating. This is true even in cases where nickel has been used with a sub-coating of copper. Cadmium has the advantage of giving a real protection to the base metal of steel when applied with one coat, whereas nickel has to be used with a sub-coating of copper to give rust resisting qualities.

Cadmium does not take as high and bright a finish as nickel does, but it has the added advantage of having the protective value from a rust resisting standpoint as well as fair finish when buffed. Although nickel gives the brighter finish, it fails as a protective coating from the standpoint of rust. Nickel in time has a tendency to turn yellow. Cadmium has a tendency to stay white even though oxidation will dull the surface that has been buffed.

Cadmium plating costs less than nickel plating. It will cost considerably less than nickel as a rust protector, for in most cases nickel will have to have a sub-coat of copper. When properly handled a silvery color will be obtained with cadmium in still plating as well as in barrel plating, which will stand up with a high finish for a considerable length of time.

PRODUCTION CADMIUM PLATING

A series of studies and experiments, which the author has carried out in one of the plants of a large eastern manufacturer over a period of several months, has brought out many interesting features and facts which may be of use to others wishing to avail themselves of this new finish.

The cadmium installation in this plant consists of two tanks each of 500 gallons capacity, with three barrels running in each tank.

A variety of work, from washers and small cup-shaped caps the size of a thimble, up to fluted pieces, and other irregular shapes of one-fifth of a square foot surface, has been plated with this equipment, the result being all that could be wished for.

The average net tonnage during this period of test has been 12 to 15 tons, per week, in this battery alone, which shows that the results achieved here were not on a small laboratory scale, but on quantity production.

All parts plated in this process were of sheet steel, both hot rolled and cold rolled stock, and as a rule each barrel contained a different article. In a few cases where one article was found to have a tendency to pack or nest, it was mixed with another article, which would tend to stop this nesting.

CLEANING

Special care was exercised in the cleaning operations to insure an absolutely chemically clean surface and to prevent the work from becoming oxidized after the cleaning operations.

The work was first immersed in a hot potash solution and thoroughly agitated up and down as well as sideways; then washed in running cold water; then dipped and agitated in a dilute muriatic acid bath; rinsed again in running cold water where it was held until a plating barrel was ready to be filled up with new work. The time in each rinse or wash was proportioned to give the very best result. This may seem an unnecessary detail but

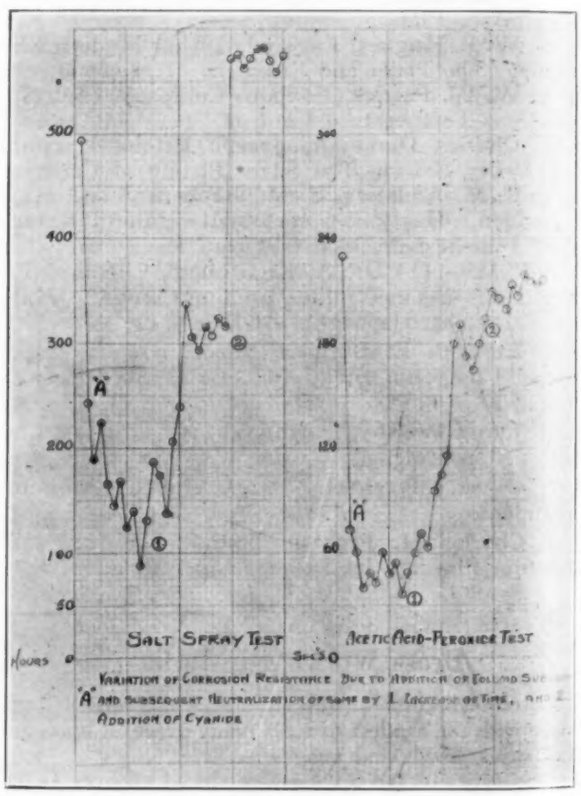


FIG. 1—EFFECT OF VARIABLES ON CORROSION RESISTANCE

many experiments showed the advantage of this precaution, as with this method, and only then, could a consistently uniform and first class plate be produced without any uneven or spotted pieces appearing when the load was discharged from the barrel.

BARREL PLATING

The time of plating was varied according to the physical properties of each article. Work which rolled freely and did not pack or nest, was put through on a time basis of

15 to 20 minutes. Flat work, which did not roll readily and tended to pack was given 30 to 40 minutes.

In some cases it was found that a mixture of two or three articles in the same barrel would, to a great extent, overcome this tendency to nest or pack, and this was taken advantage of, as far as practical. But it must be clearly understood that it cannot be used in all cases, due to cost and trouble encountered in separating, if of same shape and size. This is a job for study as money can be made and lost depending on the use of good judgment in this particular respect. The quickest and easiest way to separate such work is, of course, slow tumbling through a screen, using a fine screen in the first section and increasingly coarser in each succeeding section. The screen sizes must, of course, be so arranged as to separate effectively only one given article in each section; the number of sections depending on how many different articles or combinations of articles are to be separated.

The rotating speed of the plating barrels is also an important factor to be considered in conjunction with the plating time, as it has been found that for the same given time of plating, a variation of only two or three R.P.M. would change the appearance and protective value considerably. In one instance an article was plated 30 minutes at a speed of 4 R.P.M The appearance of the work was dull, heavy and somewhat uneven. The corrosion test showed a variation of the resistance of 40 per cent to 50 per cent in time of exposure, and in observing single pieces, it was found that certain edges and surfaces had hardly been covered at all. By increasing the R.P.M. to 6 a much better plate was obtained, and by increasing the plating time by five minutes, the result was still better, in fact, perfect, and very even. In another case a speed of 8 R.P.M. gave the best results. The apparent reason for this difference is to be found in the shape of the article. Flat work requires higher speed than work which is more evenly proportioned in all three dimensions.

If too slow speed is maintained, the resultant plate will be dull, uneven, and often show spots without any plate at all, which generally is blamed on faulty cleaning but is really due to the pieces sliding along the side of the barrel, maintaining the same relative position to each other, rather than getting a tumbling action, which will expose all surfaces evenly to the current and solution.

If the speed, on the other hand, is too high, the plate will be very smooth, with a highly burnished appearance, but will show a low corrosion resistance value. This may be improved considerably by the use of long, curved anodes, which will reach under the bottom of the barrels.

Where the highly burnished surface is a necessary part of the customer's requirements, an increase in corrosion resistance may be obtained by increasing the time, by trial, until the required coating is obtained.

The size of the holes in the barrel should be as large as possible, considering the strength of the wall as well as the work to be plated. After several trials, the barrels used in this test were all drilled with 5/16" holes, ⅝" center to center, and the rows staggered.

It is a fact, although not widely appreciated, that in barrel plating, an appreciable deposit is obtained on the parts of surfaces directly in front of the perforations. The reason for this is that the current weakens as the square of the distance, and the deflected current grows weaker, even more quickly. This led to the assumption that the actual working surface was the surface represented by the perforations. When the use of curved anodes and the rolling action within the barrel is taken into consideration, the whole submerged surface may as well be regarded as the working surface, against which the current density should be calculated. With this latter assumption as a basis, various current densities were applied and a careful check was kept on the results. Graphs and charts were prepared, and the thickness and corrosion resistance of the resultant coating was plotted against the total, as well as the unit current density. The appearance of the plate, its smoothness and color were also recorded. These records were later compared and checked. They showed that a current of 650 to 725 amp. on a calculated surface of 21 sq. ft. (30-35 amp. sq. ft.) gave a much superior coating, both from the standpoint of corrosion resistance and looks and smoothness of the surface. The voltage was kept at 5 to 6 volts across the bus bars. Anode surface was kept at a maximum of 20 sq. ft. and checked each week, and replacements made to keep this ratio constant.

Certain articles were plated a second time after assembly to cover abrasions and tool marks. For that class of work a slightly weaker current was used, 20-25 amp. per sq. ft. as it was found that the work showed a tendency to spot and streak if subjected to the same current in the second, as in the first plate. The decrease of current cleared this up and the work came out bright and clean.

RINSING AND DRYING

In all instances after the work was removed from the solution, it was subjected to a most thorough washing and rinsing in two cold waters and one lukewarm water, then dried in a heated sawdust dryer.

Do not use boiling water as it will ruin the brightness of the finish and cause streaks and rusty blotches to appear on the work.

It is also of material importance to have running water, both in the warm and cold rinses, as even a slight contamination of the last rinse water, which is carired into the sawdust dryer, will in its turn attack the sawdust and through the chemical action of cyanide on sawdust, cause spots and streaks to appear. To guard against this, it has been found of great advantage to use a 10 per cent muriatic dip between the first and second cold water rinse. The added expense of the muriatic acid dip is more than compensated for by the elimination of spoiled work.

The sawdust must be of the very best. A fairly coarse hardwood sawdust is very satisfactory, but even so it should be changed often to guard against any dampness to avoid spotted work.

CORROSION RESISTANCE

A conscientiously applied sequence of washing, plating and drying operations should guarantee a pleasing silvery plate which will withstand a salt spray test of at least 50 to 100 hours' duration.

The comparative value of exposure to the weather varies with the climate. A cadmium plated piece of work exposed to the salt air of the seasoast will withstand corrosion a limited number of months (100 hours of salt spray equals approximately 250 days in the open air). The same piece should stand up an unlimited time in a non-salt invested atmosphere.

As a general rule the solution is made up of cadmium salt in the form of hydrate or oxide, sodium cyanide and sodium hydroxide. Some experimenters have tried to improve the bath by the introduction of glue, coffee, condensed milk, cream of tartar, wood pulp, etc. While some of these adulterants undoubtedly tend to brighten the plate somewhat, they all without exception reduce the corrosion resistance materially. A study of the resistance of the plated surface was carried on all through in a most painstaking manner. Parts were taken out of production twice daily and subjected to three tests, i.e., salt spray, acetic acid-peroxide and weather exposure. As soon as

rust appeared on the surface the part was removed and the result tabulated and recorded on graphs.

The reason for such extensive tests was to try to establish a comparative chart, giving the proportionate values of all three and also to be able to see what change, if any, was brought about by changes in current density, voltage, barrel speed, or variation of formula.

The acetic-acid-peroxide test is especially valuable as it gives instant control of the plate. The foreman can, within two or three minutes, determine the resistance value of the deposit and in such manner correct any deficiency at once.

One might think that with a fairly reliable test, such as acetic-acid-peroxide test, it would not be necessary to use the other two, but the fact is that they will both give additional and valuable information, especially if a continuous record is kept of time and conditions. Irregular shaped work, especially with corners and deep depressions, is very tricky to plate at first so that it will withstand the test successfully, but with the information given by previous records, it is a very simple matter to correct such deficiencies.

KEEPING SOLUTIONS CLEAN

As in all plating solutions, but more so when there is considerable free cyanide present, it should be borne in mind that sludge or "mud" forms very quickly. The wood in the barrels, the dust in the air, and any foreign particles brought into the solution in one way or another, form a heavy sediment in the solution which, due to the agitation of the barrels, is ever present. This causes a loss of free cyanide, which increases the resistance to the current and results in a poor deposit.

It may sound far fetched, but it is a proved fact that if two solutions of same formula are run side by side, one filtered weekly and the other monthly, in a few months' time the latter will be unable to turn out work at a profit due to the uneven character of the plate caused by the high percentage of foreign matter present, while the former is still producing an excellent plate. A very good and fairly quick test for this is to use a tall cylinder of 1,000 cc capacity; fill this with solution and let stand over a period of 24 hours, or more, to permit all sediment to settle. Take a reading of the number of cc of sediment; let stand a few hours more to insure that the settlement is completed. If this shows a volume exceeding 5 per cent it should be cleaned and filtered at once.

If a solution which has for a long time consistently produced good work, within a few days turns out a black, streaky and dull looking deposit, this is generally due to contamination. This may be due to a cheap grade of anode which contain foreign matter such as copper or brass, which combining with the hydroxide, forms cupric hydroxide $Cu(OH)_2$, which deposits with the cadmium on the cathode as a dark streaky plate. In any plating room, using a cadmium bath, there will soon accumulate a quantity of ends and short pieces of anodes. The cost of anodes being around 85c. to $1 per pound, this is too valuable to scrap, and as a consequence it is sent to the foundry to be remelted and used over. If due care is taken to use a clean pot and fresh sand this will be satisfactory, but should any impurities be mixed with the cadmium, there will be trouble.

If the hydroxide content has increased considerably over the maximum allowed by the formula, the appearance of the plate will be grayish black and fairly even. This is generally due to potash being carried over from the cleaner, through the rinse and into the solution. It is therefore of great importance that the rinsing operation should be very thorough, in running water.

The remedy for this, as well as the contamination with copper, is to boil down the solution to about ⅓ of its volume, filter the clear solution from the mud and clean the tank out thoroughly. Then return the clear solution, which in the meantime should be titrated to determine its contents, and add the necessary amounts of sodium cyanide and cadmium salts if necessary.

MAINTAINING THE SOLUTION

As a general rule there will be very little call for any addition of cadmium salts as the solution maintains itself by anode corrosion and has in some cases increased the content considerably. In case of an increase beyond the limits of the formula, a corresponding increase of total and free cyanide must be made. This cannot be kept up,

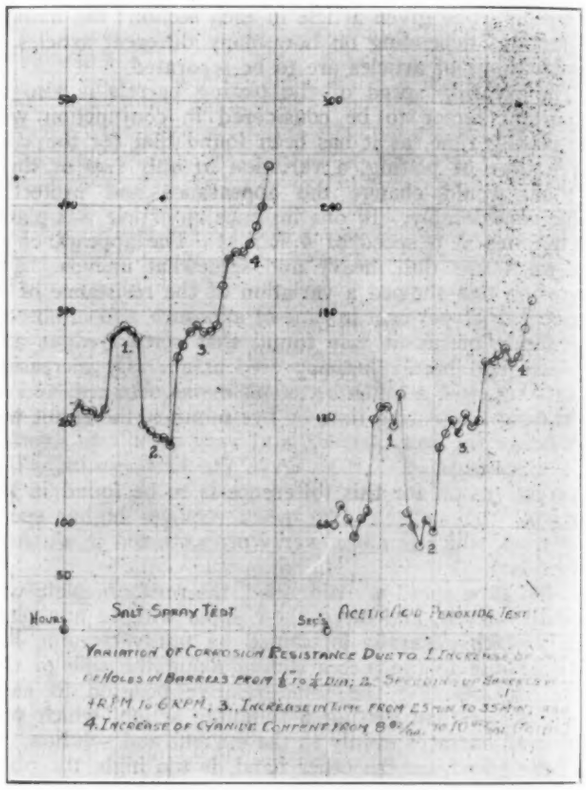


FIG. 2—EFFECT OF VARIABLES ON CORROSION RESISTANCE

however, and in order to stop the increase, steel anodes may be substituted for some of the cadmium anodes. This gives to the solution the same total current and current density, but withholds cadmium in a degree corresponding to the percentage of steel anodes used. Steel anodes made from old cold rolled shafting have been maintained in one solution for nearly a year without showing any corrosion or causing trouble in solution, and the cadmium content has, during this time, remained constant, or very nearly so, the variation over the period being less than one-half ounce per gallon. The correct amount of steel anodes to keep the cadmium content balanced must of course be found by trial.

The most satisfactory way of maintaining the solution at its highest point of efficiency is, of course, through chemical control and analysis. With a big unit, such as the aforementioned, where the tonnage plated is very great as compared to the volume of solution, analysis should be made weekly, or oftener. The methods are quite simple and do not require an expert chemist to carry them through, and the accuracy is close enough for all practical purposes. A couple of beakers and Erlenmeyer

flasks, three 50cc burettes, a 100cc volumetric flask, a spot plate and a few suitable bottles for the reagents are all that is required for the analysis. A small hood to carry off the fumes will also be needed to protect the operator.

DETERMINATION OF CADMIUM AS METALLIC CADMIUM IN SOLUTION

Pipette 10 cc of solution into a 500 cc Erlenmeyer flask. Add 10 cc water (distilled) and 5 cc sulphuric acid and boil the solution until all cyanide is decomposed and evaporated. This must be done under the hood as cyanide fumes are dangerous.

When the cyanide is driven off a thick smoke of SO_3 or sulphurous acid forms. Now remove from flame and let cool (still under hood). Dilute the solution to 250 cc and bring to a boil. Add 15 grams of sodium acetate crystals and titrate with a solution of 44.0 gr./L potassium ferro-cyanide until a drop of the solution gives a red color when mixed with a drop of uranium acetate on a spot plate. One cc of potassium ferro-cyanide (44.0 gr./L) equals 0.0157 grams CdOH.

Then if 10 cc $K_4Fe(CN)_6$ were used to titrate the solution the cadium content per liter in the solution will be:

10 x 0.0121 x 100 = 12.1 gr./L Cd
or = 13.8 " CdO
or = 15.7 " CdOH

To express ounces / gallons multiply by 0.134.

DETERMINATION OF TOTAL CYANIDE

Pipette 5 cc plating solution into 100 cc volumetric flask, dilute to the mark with distilled water, and pipette a 25 cc aliquot into a 300 cc Erlenmeyer flask. Add 50 cc water, 5 cc 10% solution of sodium hydroxide and a few drops of potassium iodide. Titrate with standard (17.0 gr.L) silver nitrate solution until the solution turns faintly milky.

1 cc Ag NO_3 (17.0 gr./L) = 0.0098 gram NaCN

If 10 cc Ag NO_3 were used the total cyanide as NaCN will be

10 x 0.0098 x 800 = 78.4 gr./L NaCN
78.4 x .134 = 10.5 oz./gal. NaCN

DETERMINATION OF TOTAL ALKALI

Pipette a 25 cc aliquot from the diluted solution in volumetric flask, which was made up for the cyanide determination, into a 300 cc Erlenmeyer flask and add 100 cc water. Add from burette ⅛ of the amount $K_4Fe(CN)_6$ used in cadmium determination and the same amount of silver nitrate solution used for cyanide determination. Now titrate with N/5 hydrochloric acid solution (17 cc of 37% acid per L) using 6 drops of phenolphatelein as indicator. The end point is reached when the color changed from red to faint pink.

1 cc N/5 HCl = 0.008 Na OH

If 5 cc N/5 HCl were used the total alkali will be

5 x 800 x 0.008 = 32.0 gr./L NaOH
or 32.0 x .134 = 4.288 oz./gal. Na OH

Tinning Iron Castings

Q.—We have a number of iron castings which need to be tinned. Would you suggest that we deposit the tin by plating, or use a hot dipping process? Any information you can give will be appreciated.

A.—The hot dip process is suitable for this work. It is performed as follows:

Castings must be thoroughly clean and free from oxide and sand. Sandblasting should be employed to take all impurities off the surface, after which the castings should be immersed for one to two hours in a pickle composed of one part hydrofluoric acid and four parts water. When removing, see that they are entirely free from scale and sand. A wire brush may be used to remove any scale or sand that remains. Castings should then be placed in clean, hot water until they are dipped.

For a flux use four parts of a saturated solution of sal ammoniac in water and one part hydrochloric acid. After drying the castings, immerse them in molten tin, which should be kept at a high enough temperature to bring the castings up to the heat of the tin without letting the tin cool off, but not hot enough for the tin to oxidize. In other words, see that the tin remains perfectly fluid after a casting is immersed in it. A sprinkling of pulverized sal ammoniac may be kept on the surface of the molten tin, or a little tallow or palm oil may be used, to clear the surface and make the tin work stand out more clearly. Some operators dip in hot palm oil or tallow at a temperature above that of the molten tin, for the purpose of draining the excess and imparting a smooth, bright surface.

As soon as the tin coating has chilled, or set, the casting should be washed in hot sal-soda water and dried in saw dust.

Another method of tinning iron castings is to immerse the castings in the following: 1% salts of tin, 5% sulphophenolic acid, 94% water. When immersed in this solution the casting is at once covered with an adherent coating of tin which can afterward be polished by means of rotating wire brushes.—P. W. BLAIR.

Sandy Castings

Q.—We are experiencing difficulty similar to that referred to in Problem 3736. The writer is forwarding under separate cover a sample casting showing hard specks which develop when the metal is buffed. These castings look good as they come from the sand, and the specks do not show until the metal is buffed.

This metal is copper 74, tin 3, lead 7, zinc 16. The trouble persists even when the electrolytic copper and all new metal is used. It is present to a lesser extent in red metal of 82 per cent copper. Our standard practice melts 80 per cent cocks and faucets scrap and 20 per cent new metal, together with our returned gates and castings, in an electric furnace, poured at 2100 deg. F. Molds are made from Albany No. 0 and No. 1 sand. These castings are gated as indicated by the notch filed on the bonnet and eight castings are on a gate.

These specks are all found on the drag side of the castings, except, in a very few instances like the sample, where it shows on both sides. It never occurs on the cope side alone. The polishing operation consists of roughing out on No. 80 emery, fined on No. 120 emery, greased on No. 150 emery, buffed and colored.

A.—On examination of sample casting under the glass we find what appears to be sand. We could tell much better if you would send us a rough casting just as it leaves the mold.

We feel, however, this trouble is due to fine sand washing and we are also of the opinion you would overcome this difficulty by half No. 2 Albany sand and half No. 1 Albany as yellow brass is a light metal and produces a lot of gas that is rather hard to get through the sand if too fine; hence the sand washes. We suggest you open up your sand in the above way and you will find less trouble from that source.—W. J. REARDON.

Chromium Improves Design of Metal Products

Chromium Plate Responsible for Revival of Art Metal Designs. An Interview at the Speakman Plant, Wilmington, Del.

By R. K. HETHERINGTON

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Out of all the mass of articles, technical papers and conversation about chromium plating, one thing stands out, and that is that chromium plating is bringing back the beauty of metal design popular years ago, but impractical then because of the difficulty in keeping it clean and bright and polished. Today, for instance, we have plumbing fixture with massive octagonal and hexagonal handles, escutcheons, nozzles and shower heads. They are graceful, but in a sense only a revival of the fixtures of years ago. They, at that time, while not as heavy as the designs of today, were finished in nickel and after a while lost their brightness. China came in and supplanted them. It was easily kept clean and always looked sanitary. However, china did not lend itself to real beauty of design, especially where massiveness was concerned. Metal does this.

Now with a permanent, rich lustre between silver and platinum—a finish that lends itself equally well to massiveness or filigree—chromium plate bids fair to sweep all before it on its rise to popularity. It is bringing with it new designs in plumbing fixtures. It is also influencing the use of color in the bathroom and helping to dress up the kitchen.

Of course we have not yet solved all the mysteries surrounding chromium plating. But compared with two or three years ago we can certainly point to progress, both in the quality of the plate and kinds of work to which the plate can be applied.

One of the most successful concerns in the application of chromium plating is the Speakman Company, of Wilmington, Delaware. The writer, knowing personally several members of the Speakman Company, journeyed there for a chat about chromium plating.

"If I had to talk about Chromium Plating, I don't

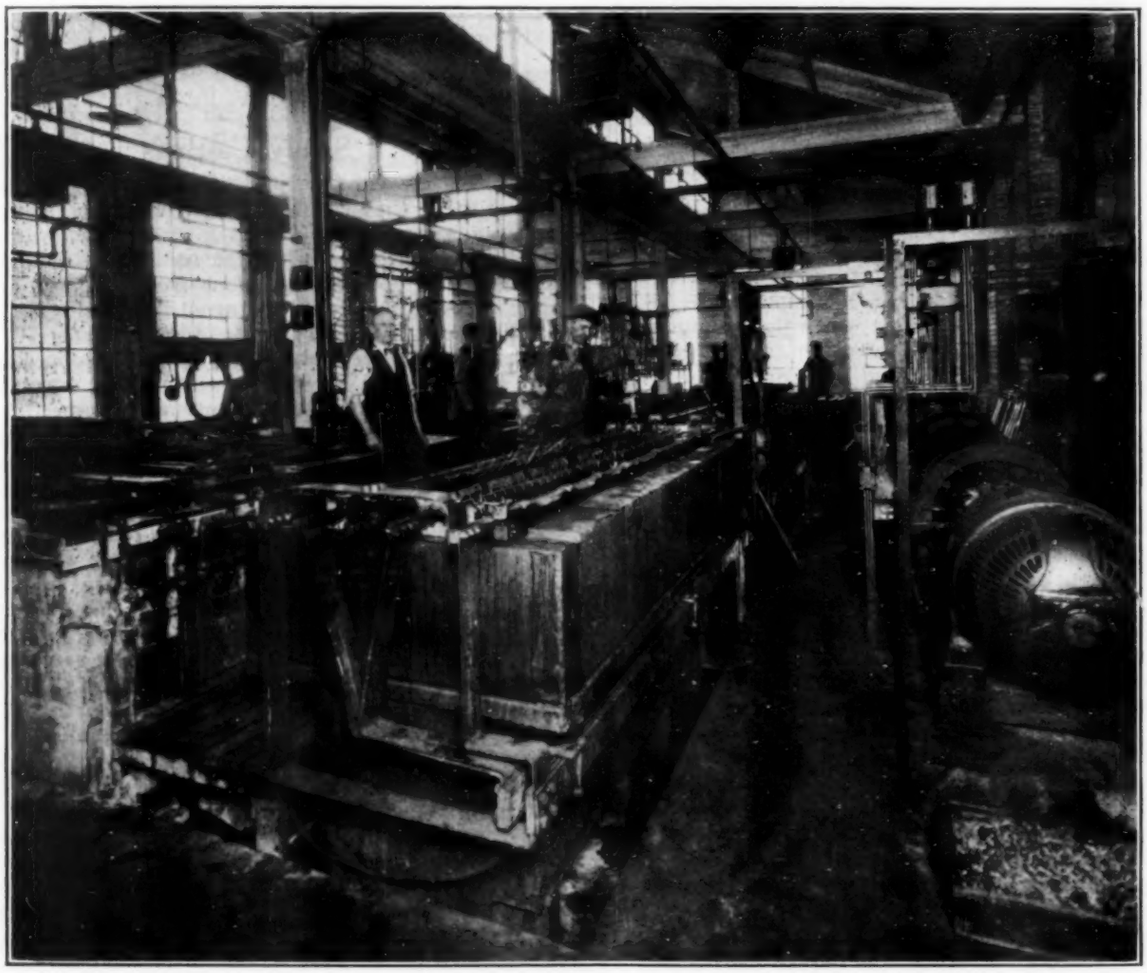


FIG. 1—CHROMIUM PLATING DEPARTMENT OF THE SPEAKMAN COMPANY, WILMINGTON, DEL.

know where I would begin," said James Fraser, Works Manager and Superintendent of the Speakman Company's plant in Wilmington, Delaware.

"We have grown up with chromium plating," continued Mr. Fraser. "Why," he said, "we have plated in everything from a five-gallon crock to our present tanks holding thousands of gallons of solution and capable of turning out tons of chromium-plated showers and fixtures every 24 hours."

"Do you run your plant on a twenty-four hour basis?" I asked. "No, but we have done practically that at times. Now with our extra tanks at work we can keep even with orders for chromium-plated products by working three nights a week."

I was impatient to get the reason why Speakman chromium plate was causing so much comment. I knew for instance that a General Electric engineer said recently that the Speakman chromium plating was the finest he had ever seen. He commented on its lack of blueness, usually associated with chromium plating.

"There's no secret about that any more than there are secrets to any other kind of plating," said Mr. Fraser. "We found that our platers used to nickel-plating had to learn their plating all over again. Our license with the Chromium Corporation of America gave us in a general way the information necessary to plate successfully, and this was more than we could do before, even though we had studied the problem from what we considered all angles. Of course our big problem was, and possibly always will be, the lack of throwing power; getting the plate into recesses, for instance. The answer to that is the right anode selection plus a knowledge of the necessary maximum and minimum temperature of the solution. Then there was the balancing effect between temperature, density and amperage. When this was all plain to us, largely through experiments, our problems started to disappear. We still had failures but we found that these were usually due to the location of the piece in the tank or the position of one piece in relation to another.

"We had to invest hundreds of dollars in special racks as relative sizes and shapes offered separate problems. We have always watched for the gassing effect which immediately stops the plating. Pipes we found were particularly hard to plate. Valve handles with four tips were a problem. The tip plated easily but the farther we went back towards the stem the less plating was apparent. We found out how to overcome this and now we seldom have any trouble with handles.

"I recently watched two platers at work at our tanks. One was a man experienced in chromium work. The other was familiar with all types of plating except chromium. The experienced man strung up his work in the tank and gave the wire an almost imperceptible twitch. The other man strung up the same amount of work and did not give it the twitch. The result of this little trick with the thumb and forefinger was apparent in the work. Both pieces were chromium-plated but the color and depth of the experienced plater's work was apparent.

"It is tricks like these that make good chromium plating. Just hanging a piece of work in a tank as in some other processes of plating means nothing. It is ingenuity that brings success in chromium plating. I have known a man good at chromium plating to stop a piece from being gassed by turning the piece a certain way. He found this out however only after he had had many a "miss."

"Many people compare chromium plating, mentally at least, to the case-hardening of steel. This is all wrong. Chromium plate is only as hard as the metal that supports it. Scratch chromium plate with a pin for instance and you are indenting the metal under the chromium. The chromium plate left without support at this point shows the mark of the pin scratch. This is not to be wondered at for a hair is .004 thick and average chromium plate is one tenth of this.

"The preparation of the parts before plating is very important in good chromium plating. This and the selecting of the parts to be plated at one time represent 75 per cent of the secret of good plating. Porous castings are to be shunned if you are trying for good chromium plating. We found also that parts which would pass easily for nickel plating would not be acceptable for chromium plating. This is because chromium plating magnifies scratches and imperfections.

"The blue cast usually found in chromium is absent in

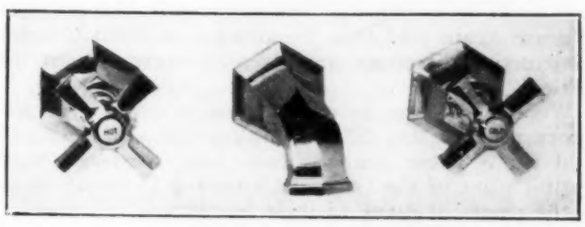


FIG. 2—NEW TYPES OF FIXTURES, CHROMIUM PLATED

Speakman chromium plate. There is no great secret how this is done. We found that by balancing all factors, temperature, amperage, density and number of pieces being plated at one time, the blue was almost entirely eliminated.

"Our men in the preparation of work to be chromium-plated always wear gloves. Some of the things which they have learned are naturally secrets. However, they found that they have to 'baby the work.' They know the thickness of the wire necessary for each piece to be plated. Work must not be shadowed by this wire. The plating of chain with all of its links is quite a trick but we can now do it perfectly.

"Some one asked me how hard chromium is. We answered this by showing this man a shower head which was buffed hard for 30 minutes, until it practically used up the buffing wheel and it never wore any part of the chromium. Recently we had another experience in chromium-plated ware. The plant of one of our customers, Bailey-Farrell Manufacturing Company, at Huntington, W. Va., was visited by a fire. We were advised that after the fire all chromium-plated ware was as good as new while nickel and other finishes were tarnished."

Plumbers' Brasswork a New Industry

Whereas the working of brass is one of the world's oldest arts, the manufacture of brass products for plumbing is a very new industry, according to C. J. Chapman, of Edward Barber and Company, London, England, whose recent address before a technical organization in Britain is reported in the Ironmonger, London. Mr. Chapman said there was some evidence that the Chinese made brass three thousand years ago, although the date was speculative, but that the making of brass water-cocks as a separate trade was little more than 170 years old.

Cocks of a kind had been used for hundreds of years. Indeed, the plug cock had been very little improved since it was first introduced 2,000 years ago. The screw-down valve developed about 1840 to 1850, and since that time the valve had very little changed, although a few refinements had been added. Today we are going in for design and efficiency, and the producer will have to educate the consumer to look for beauty as well as efficiency.

Polishing and Buffing for Chromium Plating

Methods Used and Recommended by the General Chromium Corporation

By CHARLES H. ELDRIDGE
Installation Engineer, General Chromium Corporation, Detroit, Mich.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

INTRODUCTION

Very often information about polishing of metal surfaces before chromium plating is promised by the title of an article appearing in the technical press. When we read such an article we turn away with disappointment. We are again told that the process is difficult, but no constructive directions are given to overcome our difficulties.

We hope in the following paragraphs to give some information on this difficult subject that will be of practical use. These methods have been tried out in the Detroit plant of the General Chromium Corporation, and in the plants of many of their licensees.

If some of the steps seem unnecessary to prepare work on a production scale, remember that directions such as these must be complete enough to prepare high class job work as well, and that the polishing room foreman must use his judgment as to what steps to omit.

POLISHING AND BUFFING

Due to the special properties of chromium plate the art of polishing and buffing metal surfaces before chromium plating has called for the development of special technique. The chief factor in the increased cost of chrome plate over nickel plate is due to the fact that the metal surface before chrome plate must be almost perfect in its finish. Such a jewelry job (and the phrase is often used) costs money. In no other line of electroplating is the magnifying glass so often called into use.

Chromium plate will not flow as do softer deposits, and cannot be depended upon to cover up polishing marks. In fact chromium plate will not only exactly reproduce all the underlying polishing marks and scratches but will even magnify them. A polished surface of nickel or copper plate that appears faultless before chromium plating will show up filled with polishing marks, seams, pits, etc., after being chromium plated. In fact a very important use of chromium plate, that of covering engraving plates, depends upon this property of chromium plate to reproduce exactly with great fidelity and added sharpness, the fine details of the engraving. Pits, seams, sand holes, and such defects that nickel or copper plate will cover must be completely polished out before chrome plating.

We will discuss below such important subjects as speed of lathes, buffing preparations, chrome buffing and the preparation of special metals such as steel, brass, nickel and copper plated surfaces, die cast metal, german silver, etc.

SPEED OF LATHES

The recommended speed of lathes is given below:

Grinding	from	1200-1800 R.P.M.
Polishing	"	1800-2200 "
Buffing	"	2200-2700 "
Chromium Buffing	"	2700-3000 "

The speed factor is important. A high speed combined with a light pressure will give the highest finish. In chromium buffing especially, that is in the final coloring of a chromium plated surface, it is impossible to buff a flat surface at slow speed. Without high speed, the surface will show fine scratches or buff marks.

POLISHING OF STEEL

Since the widest application of chromium plating seems to be on automobile hardware, chiefly steel, and on brass plumbing fixtures, the preparation of these and similar surfaces will be discussed in detail. A high finish chromium plate directly on steel is but seldom used. Most preparations of steel is for subsequent copper and nickel plate before the chrome.

PRESSED STEEL

On steel the preparation differs but little. For instance on pressed steel, such as radiator shells, the following is recommended for a very high class finish:

(a) Rough out on a rag wheel with No. 120 emery.
(b) Use No. 140 emery on a greased rag wheel.
(c) Use No. 160 emery on a greased sheepskin wheel.
(d) Use No. 180 emery on a greased sheepskin wheel.
(e) Finish on a tampico brush with No. 180 emery cake.

For a production job a two wheel finish with No. 140 and No. 180 emery on sheepskin wheels may be used.

ROUGH CAST OR FORGED STEEL

On rough steel, such as used for bumpers, forgings, or castings use the above method, with the exception that coarser emery must be used for roughing out. A series, starting with No. 36 emery, ranging to No. 60, No. 80 or No. 100 is recommended. A production job may need only two grades such as No. 60 and No. 120.

Iron and cast iron is prepared as above, although in some cases grinding is necessary before the polishing operation. Steel surfaces prepared as above are ready for copper plating, or for a duplex copper nickel or nickel copper—nickel plating before chromium plating. In a following paragraph is given the polishing schedule for nickel plated brass before the chromium plating. A similar operation is used to prepare nickel or copper plated steel.

BRASS CASTINGS

The preparation of cast brass for chromium plating is similar to a high class preparation before nickel plating. Before chrome plating, however, more reliance must be given to a fine emery finish, and less to a cutting down and buffing operation. Pits, seams, sand holes, etc., in cast brass will drag out if buffing is overdone, and the final chromium plated surface will not please. Previous nickel plating of brass will not cover imperfections contrary to general expectations.

The following operations have been found to give good results:

(a) Rough out with No. 80 emery, using a felt or rag wheel.
(b) Use No. 120 emery on a felt or rag wheel.
(c) Use No. 150 emery on a greased felt or sheepskin wheel.
(d) Finish with No. 180 emery flour or greased felt

wheel. For a production job the No. 80 and No. 180 emery may be omitted.

(e) Cut down using a sewed buff with tripoli as an abrasive.

(f) Color buff on a soft linen buff, using a high grade Vienna lime or other white finishing compound.

NICKEL AND COPPER PLATED SURFACES

The buffing of brass and steel after being nickel plated, and before being chromium plated must be of the highest quality. A soft linen buff is used as a rule and such a buff is to be as small as the nature of the work will permit. The minimum of nickel plate is to be removed at the same time a very bright lustre is necessary. The surface before chrome plating must be as free from imperfections as possible, and to be free of all buff marks, composition, and leave-off marks.

Such a perfect surface calls for an extra operation called color buffing and a flannel buff is used with Vienna lime as an abrasive.

Copper plated surfaces are treated in much the same way as nickeled surfaces. The copper plate must be of sufficient thickness to stand a good cutting down operation with a combination of tripoli or "White Diamond." We have found Steven's "Double Duty" compound to be highly satisfactory. A color buffing must follow.

DIE CAST METAL, WHITE METAL (GERMAN SILVER)

For such metals, the following methods may be regarded as standard:

(a) Starting with the rough casting, according to its condition, use the following series of emery, viz.: No. 140, No. 160, No. 180 to No. 200 flour emery. Use a sheepskin wheel or a felt wheel. The former is preferred. Use grease freely on all wheels.

(b) Buff lightly on sewed buffs, using a greasy composition such as "White Diamond" or tripoli.

(c) Color buff on a soft linen buff using "White Finish" or "Acme" Vienna lime. In some cases Vienna lime dipped in kerosene will give to the above metals a high finish otherwise not obtainable.

CHROME BUFFING

Unless the chromium plated article comes from the plating bath with a perfect finish, it is necessary to buff the chromium. Often it is desirable to chrome buff all plated articles to give an otherwise unattainable life or "snap." This process is called chrome buffing or coloring.

Chromium plate is unfamiliar to most buffers, and a humiliating (from the workman's viewpoint) educational stage must be gone through. A good operator will in a short time become skillful at this class of work. This is quite important, as a large percentage of success in chromium plating depends on the buffer.

For chrome buffing the lathe should run at a speed from 2,700 to 3,000 revolutions per minute. A hard sewed buff is recommended, although in some cases a soft linen buff is advised.

As an abrasive, green chromic acid compound has been found to be most useful. It can also be used to cut down burned edges and corners. Green compound is very hard to remove from threads, depressions, etc., and leaves the work in an unsightly condition. On smooth surfaces that will wipe off readily, such as radiator shells and bumpers, green composition is hard to beat. A hot strong solution of whale oil soap (6 oz. per gal.) will readily loosen green compounds from corners and depressions. Ordinary electro-cleaners will not loosen it.

For irregular work such as plumbing fixtures, a brown chromium oxide has been found most useful. Such a compound wipes out easily. Some white compounds made of levigated alumina are on the market but no brand has made a lasting success.

A Note on Copper Welding

By JAMES SILBERSTEIN, Ph.D.

Metallurgical Engineer

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

The oxy-acetylene welding of copper does not receive the recognition and application which it merits. The reason for this can be traced to past failures and uncertain results which have now been thoroughly investigated and the causes of which have been determined. On the other hand, the brazing of copper is so firmly entrenched as a method of joining that it is only with great difficulty that the superior method of welding by the acetylene process can displace the older method.

Many welders attempt to weld copper by similar methods to those used for welding steel and obtain very poor results. Hence the necessity for grasping the essential technique required for obtaining sound welds. Copper is an excellent conductor of heat. It is therefore necessary to concentrate the welding flame on the smallest area possible, otherwise too much copper will melt away. It has, however, also been established that copper welds made with the correct procedure fail close to the weld, and the cause for this has been found to be the oxygen content of the copper. The reducing gases of the welding flame combine with the oxygen of the copper, and the result is a weakening of the grain structure, resulting in brittleness.

Copper which is completely deoxidized is not rendered brittle on welding with the oxy-acetylene flame. Such copper as may be termed "weldable" is a commercial product and is available in the form of sheets, tubes and pipes. The necessity for using deoxidized copper only applies to work in which the welded joints are to be worked or submitted to considerable stresses in service, which is most general in coppersmithing. In certain classes of work where the joints are not to be worked in any way and no stresses need to be withstood, particularly bending stresses, the ordinary grades of commercial copper can be used without objection.

Measuring pH Values

In the May issue of THE METAL INDUSTRY on page 214, there was a report of a paper on pH Determination, delivered by K. Pitschner, chief chemist in the research department of the American Chain Company, Bridgeport, Conn. It was stated in this report that the discrepancy between the results of the colorimetric method and the electrometric method of determining pH suggested that further study in this field is necessary in order to improve the methods of determination. The difference observed in measuring one solution by both methods was stated as being in some cases .05. This was incorrect and should have been .5 to .6.

Nickel Plating Practice in Cuba

A Report of a Visit to Cuban Plating Plants by an American Plater

By E. G. LOVERING

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

The American plater visiting Havana, Cuba, cannot help noticing the large number of American automobiles running around the streets. And as some of the streets are very narrow, one must walk single file or Indian fashion on the side walk, and watch his step as the automobiles rush by him in close proximity. His trained and experienced eye, however, observes and sees something that makes him sit up and take notice—rust on the plated parts. He looks around him everywhere and finds it on all makes of cars, bumper bars, radiators and trimmings. The bumper bars are the worst of all. Even the new Fords have lamps covered with rust spots, so with a sort of guilty conscience the professional plater asks himself why it is so pronounced here.

On inquiring, he finds out that Cuba is practically surrounded by salt water and that along the ocean or gulf drives there is a continual salt spray in the air, which certainly shows up the good and bad deposits. They must have originated the aerated salt spray test here.

So we get to thinking, "Is there any electroplating being done here in Havana?" Getting in touch with a Spanish acquaintance who speaks English we tell him we want to go and visit the "Niquelados" which means, nickel platers. We find there are several places doing plating. The first place visited was "J. Garcia and Hno. Fabrica De Articulos De Metal," manufacturers of articles of metal. This concern manufacturers percolators, cuspidors, brass spinnings, cooler cover pots, trays and articles of Monel metal. Their plating is in nickel, copper and silver and they employ about 10 men in their plating, polishing and spinning department which are all in one room. We will describe the plating process later on as it was the same in all places visited.

We next visited the shop of A. T. Rebis who does a large business in guns, razors, antiques, silver and hardware, and has a large store in front of the shop. In fact, all the places where plating is done have large retail stores in front, which are quite elaborate. Francisco Frella, the plater, received us cordially and with the help of our interpreter he explained to us that the firm did not manufacture anything, being importers of French, Italian and German articles of metal. Their plating consists of repair and general job work taken in at the store; razors to be ground and honed, knives, chandeliers, guns, revolvers, chafing dishes, hardware, etc., and he gave us a detailed description of the way the work was handled. The knife and razor grinding machinery is the only mechanical equipment used. The rest is all hand work. They were polishing revolvers by hand.

The next and last place visited, as our time was limited, was the store and shop of Casa Kuroki "Taller De Apilar Niquelar Armeria Y Grabados" which means a whole lot. Mr. Kuroki was very enthusiastic when it was explained to him who we were and what we wanted. Right off the bat he wanted to know all about chromium and asked us all kinds of questions. He seemed to be a live wire and was very much interested in THE METAL INDUSTRY that I had with me. His store carries a general line of cutlery, knives, razors, shears, etc., and does a general job plating business. He is the largest job plater in Havana and most of the automobile parts are replated in his shop.

They were running through bumper bars when we went into the shop, but there was the general line of job plating lying around the shop, which the men were working, polishing or buffing. He didn't have as much large work around as we saw in Ed. Musick's shop in St. Louis which we visited on our way down here. The bumper bars and other steel parts are polished down to a very fine finish, four and five polishing wheel operations. They are then cleaned in a hot potash cleaner with a hand brush. They haven't been educated to the electro-cleaner, as yet; still using the old process of scouring with pumice stone and a hand brush. They are then flashed in a cyanide copper and transferred to the acid copper bath and run for 20 minutes at 2 volts, taken out and rinsed and brushed over with fine pumice stone and water and without buffing put into the nickel bath for one and a half hours. The brass parts are plated one hour.

I told him that in the States, they were using higher current densities and would do the job in half that time, and he replied in Spanish, well may be that is why we get so many parts to do over. His nickel stands up and they don't have to put oil on it as they do on the American nickel when the air is full of sea water.

But now the cars are coming in with chromium. May be they will stand up better. He said it gets quite hot in Havana in the summer months and the heat opens up the pores of the metal and the salt air does the rest to the steel parts. We believe in polishing the base metal down to as fine a surface as we can get closing up all the pores before we put on any plate. We find they stand up much better if we don't neglect the grinding and polishing previous to plating. This is a point that the American plater operating with high speed methods might well have in mind.

The Cuban takes great pride in keeping his car looking spick and span and when it don't look shiny and bright, he has it refinished.

The water rinse tanks are all made of cement, as wood has to be shipped in from the States and cement is cheap. The acid copper and nickel tank was lined with tile ½" thick. The silver and gold tanks were porcelain or enameled.

The tanks are all covered with a wood cover on a hinge and pulled up with a rope and pulley and let down after the load is in the tank plating as the polishing room, work shop and plating room are all in one.

Mr. Koroki was very much interested in the American Electroplaters Society and would like to get some up to-date catalogues of plating supplies. I carried off a nice pocket knife from his shop as a souvenir and present with his compliments.

Electroplating on Aluminum and its Alloys

From a Paper Presented at the Fifty-third General Meeting of the American Electrochemical Society, Held at Bridgeport, Conn., April 26, 27, 28, 1928.

By HAROLD K. WORK

Industrial Fellow, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa.

With the increasing use of aluminum in recent years there has been an ever growing demand for methods of plating on it. Many such methods have appeared in the literature, but few of them have met with commercial success. The difficulty with most of these processes has been that, while the deposits have an excellent superficial appearance when new, they blister and peel after short service in the presence of moisture. Another difficulty has arisen from the disregard of the composition of the alloy being coated. This, no doubt, has resulted from the popular use of the term "aluminum" to designate the alloys as well as the commercially pure metal. Yet it could hardly be expected that one method of plating would give equally good results for the commercially pure metal and also for alloys containing large amounts of either copper or silicon. Another factor which has been generally overlooked is the condition of the metal in plating on the strong alloys. These alloys show different degrees of inherent corrosion resistance, depending on whether the metal is annealed, hard rolled, or heat treated.

To make a broad study of electroplating on aluminum and its alloys the Aluminum Company of America established an industrial fellowship at Mellon Institute of Industrial Research in 1925. A summary of the results of this research follows. The writer is indebted to Dr. E. Ward Tillotson, assistant director of Mellon Institute, and to Dr. Francis C. Frary, research director of the Aluminum Company of America, for helpful advice during the progress of the experimental work.

PRINCIPLES INVOLVED

Some of the reasons advanced in the literature for the difficulty in plating on aluminum are as follows:

1. Presence of an oxide coating on the metal.
2. High position of aluminum in the electromotive series.
3. Presence of gas, such as hydrogen, either in the electroplate or in the aluminum.
4. Failure of the aluminum to alloy with the coating metal.
5. Attack of the aluminum by acids or bases in the electrolyte.
6. Action of impurities in the aluminum.
7. Presence of pin holes in the coat that allow subsequent corrosion.
8. Difference in coefficients of expansion of aluminum and the coating metal.
9. Presence of chemicals from the solution in the pores of the metal.
10. Tension in the coating metal.

By analogy with other examples of electroplating which are successful, most of these explanations lose weight. Two of them, however, cannot be so readily disregarded. These are the oxide film and the high position of aluminum in the electromotive series.

The oxides at the surface must be removed in plating on any metal if the coating is to adhere. Aluminum has a greater tendency to form an oxide coating than most other metals which are plated. As a result it is not surprising that the failure of deposits to adhere to it is often ascribed to this oxide film on the surface.

The second difficulty, the high position of aluminum in the electromotive series, introduces two possible problems in plating. It may cause deposition of a non-adherent metal layer at the start of plating and thus prevent the deposit from adhering, or, when plated with a metal far below aluminum in the electromotive series, may accelerate corrosion so much as to make the product worthless. This deposition by immersion would be similar to the action on zinc, as has been considered by M. R. Thompson.[1] Aluminum presents the same problem but to a less extent because of its passivity.

ALLOYS CONSIDERED

A group of the most commonly used aluminum alloys was selected for tests of plating methods. These alloys are based on commercially pure aluminum, which contains 99.0 to 99.4 per cent of aluminum, the remainder consisting mainly of iron, silicon, and copper introduced in the production of the metal. The metal of this composition is termed 2 S. The composition of the alloys tested is given in Table I.

TABLE I—PERCENTAGE ADDITIONS TO COMMERCIAL ALUMINUM TO FORM ALLOYS

The strong alloys may be obtained in different conditions which affect the plating. These conditions are indicated by symbols, as O, soft annealed. H, strain hardened after rolling. W, heat treated and quenched to improve strength. T, heat treated, quenched and aged to develop the maximum strength.

Alloy	Cu	Mn	Si	Ni	Mg	Zn
3 S	..	1.25	..	..	..	..
Strong Alloys						
17 S	4.0	0.5	0.5	..	..	..
25 S	4.5	0.8	..	..	0.8	..
51 S	..	..	1.0	..	0.6	..
Die Castings						
13	..	..	12.5	..	..	2.0
73	3.0	..	8.0	..	..	2.0
83	2.0	..	3.0	..	..	2.0
85	4.0	..	5.0	..	..	2.0
93	4.0	..	2.0	4.0	..	2.0
Sand Castings						
47	..	..	13.5	..	..	..
112	8.0	..	..	..	..	1.9
195	4.5	..	..	..	..	0.08

Among the sand-casting alloys, 47 has been modified with metallic sodium, and 195 has been subjected to the regular heat treatment.

TESTING OF DEPOSITS

Adhesion. Adhesion is tested by bending the specimens sharply if they are soft, or breaking them if they are hard, and observing the behavior of the plate. A poor plate pulls away from the aluminum.

[1] Trans. Am. Electrochem. Soc., 47, 163 (1925).

Corrosion Resistance. Corrosion resistance is determined by four methods. They consist in subjecting the specimens to partial immersion in salt solutions, to water vapor, to the outdoor atmosphere, and to actual service. The partial immersion in salt solutions perhaps requires explanation in view of the many methods available for such accelerated corrosion tests. The test is made by immersing the lower halves of the specimens in a solution containing 1 per cent each of sodium and calcium chlorides.

This test allows a large number of specimens to be tested for prolonged periods with a minimum of equipment. That it makes a distinction between the corrosion in different areas, aids in the prediction of the nature of the corrosion in the atmosphere. Blistering and peeling usually occur in the immersed portions, while pitting is more pronounced above the solution line. The corrosion below the solution line is generally indicative of rapid failure on outdoor exposure. The test is valuable from a strictly qualitative standpoint. The exposure to water vapor test gives results resembling those observable on outdoor exposure, but avoids dirt contamination of the specimens, thus facilitating examination.

CLEANING PROCEDURES

Organic Solvents (O. S.). Benzene, naphtha, or carbon tetrachloride may be used to remove excessive grease from the metal surface. The use of such a solvent is not always necessary, but is very effective, especially for removing buffing greases before an acid dip.

Mild Alkaline Cleaners (M. A.). Very dilute caustic soda, mixtures of sodium carbonate and bicarbonate, or commercial cleaners for aluminum are also used as grease removers with the additional advantage that they slightly attack the metal surface and make it more susceptible to the action of other solutions. The following is a good example: Sodium carbonate, 22.5 g./L. (3 oz./gal.); sodium bicarbonate 45 g./L. (6 oz./gal.). This cleaner is used hot at a temperature of 93° C. (200° F.).

Acid Cleaners (A. C.). Hydrofluoric acid is a very effective cleaner. A satisfactory solution contains 1 part of 48 to 52 per cent hydrofluoric acid to 9 parts of water. Although this particular solution will not take off heavy grease, it will at least remove small amounts left by finger prints, etc. It is slightly superior to hydrochloric acid, probably because of its action on silicon, but the latter acid may sometimes be substituted for it. The metal is usually dipped in it from ten to sixty seconds. This treatment produces an active surface.

Dilute Mixed Acids (D. M. A.). Dilute hydrofluoric-nitric acid mixtures are often very effective, where a slower attack is desired. A satisfactory combination is made by substituting nitric acid for one-half of the hydrofluoric acid in the preceding dip.

Concentrated Mixed Acids (C. M. A.). Concentrated hydrofluoric-nitric acid mixtures are sometimes used to whiten the metal surface, although more often to roughen it, and will be discussed later.

Passive Dips (P. D.). Nitric acid may also be used to whiten the metal surface and make it less active. It is, in addition, of value for stripping deposits.

Pumice Scrub (P. S.). Scrubbing with pumice can be used prior to dipping in some of the solutions which roughen the surface before plating.

Brushing (B.). Washing with a soft brush and water will often remove non-adherent particles before plating, and thereby make possible the formation of a smoother deposit. This procedure is advised whenever such particles are present.

PLATING ON A SMOOTH SURFACE

Following the common practice in plating on smooth surfaces of other metals, attempts were made at the beginning of this study, to plate on relatively smooth aluminum surfaces. For this purpose many solutions were tried. The results show that acid baths give non-adherent plates, while cyanide baths usually yield blistered ones. Of all the solutions investigated the cyanide-zinc baths give the best deposits, and accordingly zinc was chosen for use as a preparatory coating. Most of these cyanide-zinc baths, however, are so alkaline that they attack the aluminum. To remedy this defect, ammonia is substituted for the caustic soda in them.

Further experimentation showed that an addition agent is also conducive to better results. Three such agents are successful; namely, gum arabic, peptone, and gelatin. Of these gelatin is the most reliable, and is used in amounts up to 5 g./L. (0.67 oz./gal.). This relatively large quantity gives a solution that changes only slowly in service. A very satisfactory bath has the following formula:

ZINC BATH 1

	g./L.	oz./gal.
Zinc cyanide	30	4
Sodium cyanide	30	4
Ammonium hydroxide (0.90 sp. gr.)	33	4.5
Gelatin	5	0.67

This bath is used at a current density of 0.5 amp./sq. dm. (4.5 amp./sq. ft.). A five-minute plate, or its equivalent at other currents, serves as a foundation for plates of other metals. Nickel, copper, cadmium, and brass have all been applied over this zinc layer. The resulting deposits are of excellent appearance, adhere well, can be soldered, but fail rapidly in the corrosion tests. The nickel usually peels, while the softer metals blister on exposure to moisture or salt solutions. Deposits of 0.013 mm. (0.0005 in.) rarely last a day in the salt tests, and only two or three months on outdoor exposure.

However, plates on objects such as pen holders and letter openers, which were subjected to dry indoor service, are in good condition after almost two years. The application of lacquer helps to protect such plates. Except where zinc alone is used as the coat, these plates are of value for only very mild service. It is possible nevertheless to make them much more resistant to corrosion by a heat treatment. Where this heat treatment is used, copper is applied over the zinc layer from a cyanide bath and then the object is subjected to heat. A copper bath that can be recommended for this application is as follows:

COPPER BATH 1

	g./L.	oz./gal.
Cuprous cyanide	22.5	3
Sodium cyanide	30	4
Sodium carbonate	15	2

After a short time the plating may be finished in an acid copper bath if desired. The use of cadmium, nickel or brass, instead of the copper, over the zinc proves unsatisfactory when the heat treatment is used. To ensure this greater corrosion resistance in the process, alloying of the coat with the base metal appears necessary. Such a method is applicable to every alloy that has been studied.

The heat treatment is easily accomplished in a muffle furnace or in a nitrate bath. A temperature of

430° C. (806° F.) in a muffle for 30 minutes is sufficient to cause alloying when 2S is coated. With lower temperatures a longer time should be used, but any temperature below 330° C. (626° F.) requires an excessively long time of heat treatment. With the strong alloys it is advisable to combine the usual treatment to develop the strength with the treatment that makes the plate adhere. The following are the steps in the procedure for obtaining a nickel plate on aluminum: zinc plate, copper plate, heat treat, buff, and nickel plate. This order gives a better finish than if the nickel is applied before the heat treatment. This result is due, no doubt, to the fact that solution is included in the pores of the copper plate, and, on being expelled, roughens the surface.

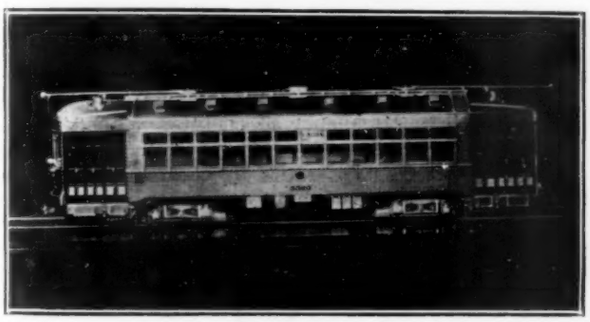
The process has limitations, but is included here for the application it does have. The major objections to it are as follows: (1) The heat treatment anneals the widely used 2S and 3S alloys; (2) The heating is an added expense; (3) Large objects buckle during heating; (4) Copper accelerates the corrosion of the aluminum and causes more rapid pitting, where nickel is the final coating.

As a result of these tests, as well as trials of other processes described in the literature, the author has come to the conclusion that most plates on a **smooth** aluminum surface are to be viewed with doubt as to their commercial utility, unless they have been heat treated.

This article will be continued in an early issue.—Ed.

A Sterling Silver Trolley Car

One of the finest examples of mechanical perfection in the art of silversmithing was recently produced by Marshall Field & Company for the Chicago Surface Lines. This trophy was presented to the Lincoln depot in a No Accident Campaign conducted in the city of Chicago. The trolley car, as illustrated, is made entirely of sterling silver supplied by Handy & Harman, Bridgeport, Connecticut. It weighs 550 ounces, is 36 inches long, 8½ inches high.



STERLING SILVER TROLLEY CAR

It wasn't until the drawings were reduced to ¾ inch to the foot that the designers discovered that there were a number of interesting things which had to be provided, such as lightning arrester, air compressor, ventilators with intake and exhaust, air reservoirs, fuse boxes, resistance coils, sand pipes and they even found that a modern trolley car has knees, as a matter of fact, four of them.

Each of the cane covered seats made of sterling silver is 2 inches long and 1 1/16 inches wide and weighs 3¾ ounces each. The large truck wheels are 1¾ inches in diameter, and the small ones 1 9/16 inches in diameter. The trolley poles are 10¼ inches long and the wheels on the trolley ⅜ inch in diameter. The silver rope is 27/1000 of an inch in diameter and weighs 2 grains to the inch. The stools for the motorman and the conductor are 11/16 inches in diameter and weigh ⅛ of an ounce each.

The glass in the windows and doors was cut from imported glass which came from England, as were the lenses in the head lights which are 13/16 of an inch in diameter and were ground to fit.

Wind Gales Used to Operate Pipe Organs

More than 18,000,000 pounds of air are blown within the pipe organs of the United States every day to provide music in the nation's churches, theatres and auditoriums, according to figures compiled by ventilating engineers who are conducting a survey to show the important part that electrically controlled air plays in every phase of American life. Driven by powerful metal blower type fans, veritable gales of wind pressure are created within the pipe organs to produce the resonant musical notes from inanimate metal. From the time of the foot-pumped, grunting organ in the "little old church on the hill" and the hand-manipulated hurdy-gurdy that ground out its musical cheer on the streets of the big cities, the engineers have been developing methods for mchanically creating air pressures for organs which would be both efficient and quiet. In the modern pipe organ, the fans are specially constructed with special motor, mounted as a unit on an absorbent foundation and provided with a flexible air pipe connection so that not the slightest machine or air noise will magnify or travel through the quietness of a church or similar building. The principle is similar, however, to the type of air control used for ventilating tunnels and buildings, and pneumatic conveying of shavings, dusts and gases as used in many industries, according to the engineers.

MODERN PIPE ORGAN

The Future of the Electroplating Industry

A Message to Manufacturers and Users of Electroplated Products

By A. P. MUNNING

Chairman of the Board of Directors of The Hanson-Van Winkle-Munning Company, Matawan, N. J.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Measured by past accomplishments, the future of the electroplating industry has four general omens for good. These are:

(1) Continued prosperity.

(2) A greater interest on the part of the public in higher standards of finish and beauty.

(3) Recognition by the executives of manufacturing establishments that insofar as they develop beauty in their products, they must recognize the importance of the plating department in their manufacturing and sales activities.

(4) World-wide recognition of the subject of electroplating by scientific bodies and the trade press.

The first analysis, that of continued prosperity is recognized and understood by everyone. So long as business is good, the electroplating industry will get its fair share of that prosperity; and we doubt very much, with increasing competition by manufacturers in general, if it will lose any of its popularity, since we believe there will be a growing demand for better and more permanent metal coatings.

A. P. MUNNING

To appreciate public interest in our industry, one has only to compare metal coated articles of today with those of the past. Any intelligent observer will immediately realize the vast strides in the art of electroplating, as well as the many additional uses to which electroplating is being adapted and the ever increasing number of articles so treated. We venture to say that within the past decade the volume of electroplated articles has increased over a thousand-fold and the art has advanced more than was even dreamed possible twenty years ago.

Executives were very prone up to within the past few years to regard their electroplating and finishing departments as a more or less necessary evil. Today we find that it is a comparatively easy matter to discuss electroplating intelligently with the executives of large manufacturing plants and to arouse their interest in their plating operations. In fact, it is now recognized that in order to compete with large scale production and the installation of large automatic equipment, we must find a higher grade of executive in charge of the department as well as obtaining executive approval for the large appropriations which are required to put the needed equipment in actual operation.

Electroplating has become a subject of real general interest to the public and this is manifested by the treatment it is receiving from trade publications and papers not directly interested in plating. A very considerable amount of space has been devoted during the past six months to electroplating, by magazines covering such varied fields as metal working, automotive, electrical, chemical, plumbing, hardware, jewelry and scientific publications. These articles have ranged from material handling in plating rooms to the advantages of different kinds of coatings, for rust resistance and appearance.

The electroplating industry has long waited for this recognition and our opinion is that the next step will be that of finding new fields where electroplating will be found more economical than present methods.

In the past, electroplating has been confined to several well known metals such as gold, silver, nickel, tin, copper, brass and zinc. Recently, cadmium and chromium have been added to this list, and we think that the use of new agents for coatings has just begun. If we could look into the future, we could almost predict that many new alloys of metals not now used will be employed and that new metals will be applied to further increase the utility and beauty of the articles to be coated.

How many have realized until recently the value of rust proofing and permanency of coatings applied to prevent rust? Where formerly this was usually applied by other means, we find zinc, cadmium and other alloys distinctively used for this purpose and permanently beautifying and preserving from decay and rust the articles so electroplated. Can anyone gainsay that the use of electroplating for rust proofing will grow and include large structures as well as small ones, which are not now so treated, but must be so treated in order permanently to withstand the ravages of time?

Then, too, in the recent past, many strides have been made in the coating of dielectric materials about which much will be heard, in our opinion, in the future. We refer to such substances as rubber, which is being coated in a commercial way and in a very satisfactory manner on metal today. If rubber can be so coated, is there any reason why we should not learn to coat with other dielectric materials?

Measuring the future by the past, we now find scientific societies established for the intricate and theoretical consideration of the scientific problems involved; a society established for diffusing knowledge, both scientific and common sense, by and to plating executives; cooperation between these societies and the larger group of manufacturers with the Bureau of Standards at Washington, D. C. We find classes of chemistry in our various colleges and vocational schools, giving attention to this very important phase of industry and we find men devoting their entire lives to the purpose underlying our art, on all sides of the industry.

All of the above augurs well for those who are sincerely interested in the future of electroplating. A great many more uses for electroplating will be found. A great many more articles will be covered. A great many more types of coatings will be discovered and a great many more men will devote themselves to the task of scientifically and practically perfecting the art.

American Foundrymen's Meeting in Philadelphia

A Report of the 32nd Annual Convention, and Machine and Equipment Exhibition, Held May 14-18, 1928

The 32nd Annual Meeting of the American Foundrymen's Association was one of the liveliest in its history. The place of meeting, Philadelphia, brought together a number of the oldest members of the Association who had helped to form it in that city in 1896. A reunion dinner was held at which thirty-one attended who had been present at the 1896 convention. Among those who are familiar to THE METAL INDUSTRY were W. J. Coane, Ajax Metal Company, Philadelphia, Pa.; Wm. J. Devlin, Philadelphia; Howard Evans, Philadelphia; W. E. Fulton, Waterbury Farrel Foundry and Machine Company, Waterbury, Conn.; John Hill, Hill and Griffith Company, Cincinnati, Ohio; S. T. Johnston, S. Obermayer Company, Chicago, Ill.; George C. Matlack, William Cramp Ship and Engine Building Company, Philadelphia; Charles Pettinos, New York; George T. Pettinos, Philadelphia; S. D. Sleeth, Cambridge Springs, Pa.; J. A. Steinmetz, Philadelphia.

A number of social events were on the program, and the visiting ladies were given their usual round of entertainment. A number of plants were thrown open to visitors and among them some of the largest brass foundries in Philadelphia.

EQUIPMENT EXHIBITION

The exhibition of equipment was one of the most interesting ever held. Two years have elapsed since the previous exhibition, and although nothing of revolutionary character was shown, a number of exhibits held the interest of brass and other metal foundrymen.

The Tabor Manufacturing Company of Philadelphia showed a very interesting core machine with a 4 inch pattern drawer which takes core boxes up to 14 in. x 24 in. x 7 in. This company also showed a multiple molding machine which was a decided attraction to the visitors.

The Monarch Engineering and Manufacturing Company of Baltimore, showed several new types of equipment. They had an oblong lead tumbling furnace, a superheated air furnace, a revolving core oven and a tilting reverberatory furnace for drosses, sweepings, etc.

The Deister Concentrator Company, Fort Wayne, Ind., showed their Leahy No-Blind Vibrating Screen for screening foundry sands. This screen fluffs and aerates the sand and removes shots, gaggers, clamps, nails, etc.

The Globar Company of Niagara Falls, N. Y., had on exhibition their new heating element for electric melting.

The Ajax Metal Company of Philadelphia, showed a

A VIEW OF THE FOUNDRY EQUIPMENT EXHIBIT AT PHILADELPHIA

new refractory for lining the Ajax-Wyatt electric induction furnace for melting brass. This refractory has been developed for use on high copper mixtures and has made the furnace suitable for general brass foundry work.

Program of Papers Presented

SCIENCE IN THE FOUNDRY

By E. F. Hess

Science in the foundry has as its primary objects high quality and uniformity of results. It can best be achieved by laboratory control and careful, systematic checking of works operations. Laboratory control centers about three main divisions:

1. **Chemical analysis** to check purchases, sales and metal conservation.

2. **Temperature control** by means of pyrometers. Pyrometers should be manipulated according to definite standard methods developed for each foundry. Pyrometers must be checked for accuracy against a standard control pyrometer kept for that purpose, these checks to be made frequently to guard against inaccuracies which occur as pyrometer readings change with use. Every six months, at least, pyrometers should be overhauled at the factory and put in good repair.

3. **Sand control.** Testing by the types of equipment developed for determining moisture, porosity, bond, strength, etc., to determine the amounts of new sand necessary to bring the old sand up to strength.

The discussion on this paper centered largely about the use of pyrometers.

N. K. B. PATCH
Chairman of the Brass Round Table

F. L. WOLF,
Who is active in A. F. A. committee work

L. W. OLSON,
Director, A. F. A.

RISERS, THEIR NEED AND FEED

By R. R. Clarke

Metal flowing from the mold into a riser is essentially colder in the riser than in the casting and will naturally freeze quicker bulk for bulk, which is the improper order for feeding. To attain the correct condition, riser bulk and volume should be predominating and temperature of metal raised by pouring hot metal directly into the riser.

The power of a high-up pouring sprue or pressure gate to displace a riser on a bulky, low-shrinking metal casting was a disputed point at the Chicago (1927) convention of this association. The case discussed was an eight-inch diameter by twelve inch long solid cylinder molded on end, gated at the bottom with a small gate and poured of 80-10-10 metal, with no riser attached. At that time the author of this paper questioned the complete solidity and calculated dimensions of a casting so poured. Examining the condition we find the volume to be 600 cubic inches, surface 400 square inches, ratio of volume to surface three to two and the weight close to 200 pounds. Here bulk is decisive and volume heavy. Molded on the flat, this casting shrunk as shown in Fig. 8, showing that heavy shrinkage is an inherent part of the metal in this form, i.e., **that the shrinkage is there.** To assume that the shrinkage suspends merely because the casting is poured on end is an absurdity. Moreover, of two such castings in the same mold and poured at the same instant from the same ladle, the one with a riser weighed two pounds more than the one without a riser.

Regarding the high gate pressure deriving from a high-up pouring head, it might be stated that this high gate pressure will invariably give a more full and solid casting up to certain limitations than a gate of lower pressure, but the fact cannot be overlooked that this pressure is fundamentally only a hydro-static pressure obeying the laws of a liquid and applying only during the tenure of fluidity in the gate. Once the gate at any point freezes back of the casting, pressure and feeding from the gate at once stop. To pour, from the bottom, a heavy casting of this nature with a small runner gate means that when this gate freezes it severs all relations with the casting and leaves the casting, so far as the gate is concerned, absolutely self-supporting against shrinkage, regardless of the gate height or pressure.

THE EFFECTS OF LEAD IN THE PROPERTIES OF A COMPLEX BRASS

By O. W. Ellis

This paper gave the results of work done to check other investigators in complex brasses such as manganese bronze, etc. The author found that lead was only very slightly soluble. Over about 0.4 per cent lead showed as a separated constitutent and affected most of the physical properties of manganese bronze adversely. The tests were made on chill castings only and were consequently not conclusive for brass castings. Lead over 0.4 per cent lowered the tensile strength, elastic limit and ductility of the samples made.

REFRACTORIES FOR BRASS FOUNDRY FURNACES

By H. M. St. John

This paper supplements a previous report by the Committee on Non-Ferrous Survey, a sub-committee of the Joint Committee on Foundry Refractories. It classifies the various types of brass-foundry furnaces and discusses refractory experiences with each. An attempt is made to indicate the relative importance of refractory requirements in different furnaces and to show the progress which is being made in meeting these requirements. Emphasis is placed on the desirability of improving "average results" to a point where they more nearly approach "best practice."

EFFECT OF MELTING AND POURING CONDITIONS UPON THE QUALITY OF NO. 12 ALUMINUM ALLOY SAND CASTINGS

By T. W. Bossert

1. There appears to be a definite relationship between crystal size and drawing, in that a coarsening of crystal structure indicates increasing tendency for draws to appear.
2. With constant pouring temperature, increase of melting temperature produces increase of crystal size and causes drawing.
3. An increase in pouring temperature results in more pronounced drawing and coarser crystal structure than does an identical increase of melting temperature alone.
4. Soaking tends to cause formation of draws and coarse crystal structure. This tendency is much more pronounced at high than at low soaking temperatures.
5. The same conditions which cause coarse crystal structure and drawing also tend to promote cracking of the casting.
6. Remelting has been found to remove the detrimental effects, as regards drawing, cracking, and coarse structure, produced by the previous melting.
7. The basic effects described are not altered by change of pattern, variations in impurity content, or normal variations encountered from lot to lot of metal, and can be produced on metal remelted one or more times.

THE SCHEDULE FALLACY

By J. J. Ewens

This paper endeavors to prove that the practice of selling castings on a weight schedule should be discontinued, and in its stead a system of selling castings on a special price for each pattern be adopted. Then instead of blindly selling a casting at a certain figure, because it falls within a weight bracket, the selling price will be based on the actual cost of the particular job, a cost that takes into consideration all the variations and particular features of the particular pattern. Variations which we have seen, radically affect the cost either increasing or decreasing it. In short, it will be a sounder, better way of merchandizing our product.

THE AMERICAN BOY IN THE FOUNDRY

By F. J. McGrail

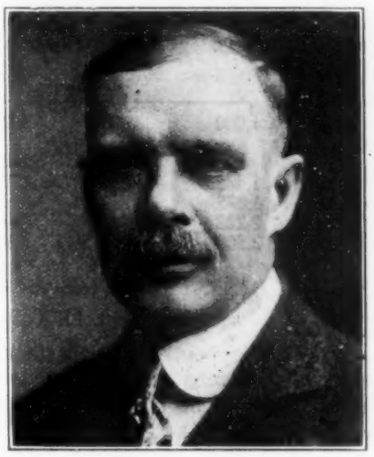
We must make every effort possible to reinstate the American boy in our foundries. When he comes to work in the morning greet him with a smile instead of a frown. Get acquainted with him. It will pay you big dividends in the end. Don't throw him into the melting pot and forget all about him. Before you put him on any kind of foundry work be sure that he is properly warned of any danger connected with it. Many times we have seen splendid young fellows mutilated because they were not warned of the hazards of some task assigned them. The American boy is your very best bet and is 100 per cent all right if you give him a square deal. A million of them gave a splendid account of themselves in France as you well remember, and we are sure they can render just as good an accounting in the foundry industry if you give them a chance.

With a constant lessening of the visible supply of competent molders facing the foundry industry, mechanical appliances and attachments will have to be installed in our foundries to eliminate the hard manual labor incidental to the work in order to make the job attractive. We did it for the man. Let us do something for the boy.

MATERIALS HANDLING AND ITS RELATIONSHIP TO BUILDING PLANS

By E. F. Scott

It is desired to impress on foundrymen the extreme necessity of proper layout for material handling in relationship to building plans. This paper has endeavored to take one through the main equipment items required in the modern foundry and show how they involve the building. While every foundry is a problem unto itself, still the generalities herein indicated should serve to show that the new development of a foundry plant or rehabilitation of an old one demand that foundry engineering be used in its best developed and most available form. It is true there is much to be learned as yet, but even so proper engineering development of the right kind must not be turned aside as worthless.



JESSE L. JONES,

Metallurgical Editor of The Metal Industry, who is prominent in foundrymen's committees

Yard handling, charging, hot metal transportation, mold conveying, sand handling and distribution, return of flasks, etc., to the molding machine, conveying cores, shakeout, knockout, conveying of castings to the cleaning room, handling in and out of the cleaning room, and so on, all demand some sort of material handling whether by wheelbarrow or highly developed machine. We must not fail to consider all items even in the small foundry where, though we may not place as much labor-saving equipment as we would like, still there is usually some place to install some kinds of it. The extreme amount of material handling to produce one ton of finished castings cannot but help impress us of the necessity for this.

THE APPLICATION OF THE ELECTRIC TRUCK TO MATERIAL-HANDLING IN THE FOUNDRY

By Harold J. Dorus and C. S. Schroeder

The ever-growing demand for mechanical substitutes for the human element in the foundry has brought home to all those who are connected with this phase of industry, the well-recognized fact that increased production with the resulting reduced costs will be the benefits derived from such mechanical devices when the demand for, and the application of, the various pieces of equipment have been analyzed, the savings estimated, and such savings have been found to be sufficiently great to warrant such an installation.

A considerable part of the expense with which those

responsible for the economic operation of the foundry have to deal, is represented by the item called "Non-productive help," and it is this item that we will endeavor to prove can be materially assisted by the installation of an electric truck. A brief abstract of the operation of an industrial electric truck in a small foundry is given.

RETURNS FROM MATERIALS HANDLING EQUIPMENT

By J. J. Hartley

Various computations have been made showing that it is necessary to handle or rehandle from 150 to 200 tons of material to produce one ton of castings in the average foundry. It is therefore evident that materials handling is a major item of foundry cost and improved methods or short cuts which reduce this cost and tonnage ratio will result in lower cost of product. The following table gives a rough summary (eliminating complex accounting) showing how expenditures in equipment can be judged:

AMOUNT THAT MAY BE SPENT FOR EACH $1.00 PER TON REDUCTION IN COST, USING 20% PER YEAR FIXED CHARGES

Annual Earning in Percentage	Annual Production in Tons									
	1,000	2,000	3,000	5,000	10,000	20,000	30,000	40,000	50,000	60,000
100	$ 833	$1,660	$2,493	$ 4,165	$ 8,330	$16,660	$24,990	$ 33,320	$ 41,650	$ 49,980
50	1,428	2,856	4,284	7,140	14,280	28,560	42,840	57,120	71,400	85,680
33⅓	1,875	3,750	5,625	9,375	18,750	37,500	56,250	75,000	93,750	112,500
25	2,222	4,444	6,666	11,110	22,220	44,440	66,660	88,880	111,100	133,320
20	2,500	5,000	7,500	12,500	25,000	50,000	75,000	100,000	125,000	150,000

BASIC PRINCIPLES OF MANAGEMENT

By J. D. Towne

The author outlined a system whereby management, working between capital and labor, operates industrial enterprises. The function of management is to plan execute, control and develop. Under the head of planning some plant layout, production schedules, man load budgets and expense budgets. The execution, of course, follows directly after planning and the control must be such as to keep the execution of these plans up to the maximum and the expenditures to a minimum. Development is applied to new products and personnel, including design, experimental work, wage payments, bonus payments, price unit outputs, etc.

THE SURFACE CONDITIONS OF CASTINGS AS AFFECTED BY CORE-SAND MIXTURES

By H. L. Campbell

An investigation has been made to obtain information on the factors which control the smoothness of the surfaces of castings which are formed by cores. The plan for this research was to prepare dry sand cores from definite combinations of sand and to use these cores as parts of molds. After pouring the metals in contact with the core specimens, the surfaces of the castings were cleaned and examined for relative smoothness. Observations on the effects of different sands and other materials used in core sand mixtures on the "finish" of castings are recorded in this report.

BRASS FOUNDRY ROUND TABLE

A special round table discussion was held after a luncheon for brass foundrymen on Tuesday, May 15th, at the Bellevue-Stratford Hotel. As usual at these affairs, discussion was free and open because no reports were made and no records kept. The discussion ranged over a wide field, from the yield of good castings per pound of metal melted to the elimination of porosity.

Considerable discussion centered about the question of furnace atmospheres and although there were numerous opinions on this subject, the majority seemed to feel that the ideal atmosphere in an open flame melting furnace was almost neutral, but slightly oxidizing rather than reducing. It was estimated that on general brass foundry work a yield of 50 pounds of good castings for every 100 pounds of metal melted was as good as could be expected. Porosity can be avoided by keeping the oil in the cores down to a minimum; also the moisture in the sand. The melt should not be soaked in the furnace, but poured as quickly as possible after being brought to the proper temperature.

APPRENTICE TRAINING

A number of reports were brought in by local committees on programs of apprentice training in various centers throughout the country. It seems that the problem of providing skilled labor for foundries has been brought home to the industry and that definite programs have been undertaken co-operatively with the aid of trade schools in various localities. Reports were presented from Philadelphia, Pa., East Chicago, Ill., Pittsburgh, Pa., Milwaukee, Wis., Oakland, Calif., Moline, Ill., and Harvey, Ill., showing a concerted effort on the part of the foundry industry to keep itself supplied with the necessary forces. This development is most encouraging.

WHAT MATERIAL HANDLING EQUIPMENT CAN DO FOR THE JOBBING FOUNDRY

By W. B. Marshall

1. Saving floor space, thus reducing fixed charges.
2. Increasing volume of output, thus dividing the fixed charges of the plant into more units of output and decreasing the unit cost.
3. Insuring established output by setting a pace for the actual work being done.
4. Reducing indirect labor charges by cutting down the handling between operations and other labor not directly applied to the manufacture of the product.
5. Reducing direct labor.
6. Reducing labor turnover by improved operating and safety conditions.

New Officers of the A. F. A.

Samuel T. Johnson, who was elected president of the American Foundrymen's Association, has just served a year as vice-president. He is vice-president of S. Obermayer Company of Chicago, Ill., and of the National Engineering Company of the same city.

Fred Erb was elected vice-president of the American Foundrymen's Association. Mr. Erb is president of the Erb-Joyce Foundry Company of Detroit, Mich.

Five directors were elected as follows:

L. W. Olson, works manager of the Ohio Brass Company, Mansfield, Ohio; S. W. Utley, vice-president Detroit Steel Castings Company, Detroit, Mich.; P. H. Johnson, general works manager Cresson-Morris Company, Philadelphia, Pa.; P. J. Krentz, vice-president Buffalo Foundry and Machine Company, Buffalo, N. Y.; C. E. Hoyt, executive secretary American Foundrymen's Association.

Sampling and Evaluating Secondary Metals

A Complete Description of the Precautions Necessary in Sampling All Types of Waste Metal

By T. A. WRIGHT

Secretary, Lucius Pitkin, Inc., New York

A PAPER READ AT THE NEW YORK MEETING OF THE INSTITUTE OF METALS DIVISION, THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, FEBRUARY, 1928

The sampling of waste materials containing copper, lead and tin, has taken on a new significance within recent years, and is of increasing importance on account of the entry of some of the copper refineries into this field and the tendency towards consolidations among the smelters. In the past, such material was sold on the basis either of a rough or grab sample or of casual inspection of the lot.

The two principal sources of this waste are the processes of fabrication and the scrapping of automobile, electrical, plumbing, railroad and other equipment. In both cases much material can be sorted, salvaged and sold by classification and grade to be melted "as is" or with the addition of new or virgin metal. The increasing care in classifying exercised in the large manufacturing plants tends to increase the proportion of this usable scrap; on the contrary, the increasing use of more complex and special non-ferrous alloys tends to make sorting and grading more difficult in turnings, borings, clippings, etc., and consequently is making sampling of more moment.

In tin, lead, aluminum, and zinc furnace by-products such as ashes, drosses, skimmings, etc., the trade practice of evaluation has not varied much. For instance, tin drosses, battery lead, and aluminum skimmings are ordinarily sold on what is called "metallic button" or "metallic recovery" or "metallic yield." Copper and lead waste, however, is being sold more and more on actual copper and lead contents based on sample and chemical analyses.

This paper will be devoted chiefly to the sampling of materials suitable only for refining and recovery of one or more of the metals present. The methods described are often based on the fact that but one metal, such as copper, is to be paid for. The loss of volatile constituents in melting does not appreciably affect the final copper result, as the "after-melting" assay can be readily calculated to the "before-melting" basis, but if smelter efficiency continues to increase, so that in time zinc, for instance, may be recovered on a paying basis, the method of sampling dirty brass, for example, will have to be changed also.

As a matter of fact, we may expect that improved refining processes will make possible the partial recovery of lead and tin which are now lost.

GENERAL PRINCIPLES OF SAMPLING SCRAP

Mathematics enters very little into the sampling of metallic scrap as such. The drawing of the sample is all important, and no substitute for personal selection made jointly by the representatives of the buyer and seller has yet been found. On the other hand, on copper-bearing material, as it is known in the trade, the definite ratio of the lot may be set aside and true coning, sampling and quartering practiced as in ore sampling. Table 1 shows a rather rough group of types in which selection has the larger importance and Table 2 those of which definite proportions should be taken. A combination method is advisable when judgment is a large factor and conditions admit: For example, in shipments of skimmings, there may be large chunks of metal; if the sample is being drawn by the tenth or fifth shovel or by an automatic mill the large metallics should be set aside, broken up with a sledge, mixed, quartered down and weighed. The final sample for melting should be made up of the proper proportions of fines and the broken metallics.

TABLE 1.—ROUGH GROUPING OF METALLIC SCRAP WHEN SELECTION IS OF GREATEST IMPORTANCE (CLASS A)

Scrap Metal	*Sample	Copper Per Cent High	Copper Per Cent Low	May Contain	Free Iron Per Cent High	Free Iron Per Cent Low
Armatures	M-T	25	10		80	5
Arc lamps	M	66	27		50	0
Brass scrap	M	85	10		80	10
Breakage	M	65	30		35	0
Briquetted metal	M	99	45			
Bronze Scrap	M	90	75	Sn		
Carburetors	M	83	73			
Coils—electric	M-T	90	17		66	0
Composition scrap	M	85	60	Sn		
Copper scrap	M	99	87			
Fields	M-T	50	25		70	20
Bottoms, furnace	M-D	93				
Generators	M-T	20	10		80	5
Gaskets	M	71	48		15	0
Radiators		Flat Rate		Sn-Pb	20	
Tuyeres	D	96	88			
Valves	D-M	88	45	Sn-Pb	5	
Wire and cable	M	31	13	Pb-Sn		
Copper—clad steel wire and BX	T	70	10		90	30
Tinsel, cordage, magnet wire	M	50	20			
Insulated wire	M	91	30			

* M = Melt; T = Matte; D = Drill.

The aim at all times should be to minimize the personal equation, but to keep in mind that free metal is invariably present and that the lot is probably very unhomogeneous.

In Class A (Table 1) the representatives of both buyer and seller select a number of pieces, which will be as nearly typical as is consistent with the weight and value of the lot. Hand work is not only unavoidable, but desirable. For example, a carload of briquetted or bundled wire may have "bricks" or "bundles" consisting wholly or in part of heavy insulated and cotton-covered wire, soldered ends of clean wire, lead-covered cable, and copper gaskets. Haphazard selection is wrong and taking every tenth may be very unfair; a number of each type, dependent on occurrence, should be taken and one-half of each "brick" sheared off and cut up into small pieces. The pile can then be mixed with shovels and quartered down to a weight of 10,000 to 30,000 gm. (20 to 60 lb.) and melted.

Another example would be armatures, which run, of course, very high in iron. A sufficient number of each type, which may be one of each or more, may be first stripped by hand. A greater net weight can then be melted unhampered by unwieldy amounts of iron.

In tuyeres, one or two should be selected and the inside scraped and cleaned before drilling, if possible. Obviously, the tuyeres taken for a sample should be weighed before and after cleaning, although no melting is done.

It should be evident from the cases mentioned that the sample taken may be anything from 1 to 50 per cent. of the lot of scrap.

In Class B (Table 2), however, a more or less definite scheme can be outlined to cover a sample of 1, 5, 10 or 20 per cent., depending on the percentage of free metallics and the particle size. The main point lies in the manner of taking the sample. Each man engaged in unloading the car should be assigned to a certain area and the removal of the material should be along a definite line, say from right to left or vice-versa, setting aside the fifth or tenth shovelful

TABLE 2.—ROUGH GROUPING OF METALLIC SCRAP OF WHICH DEFINITE PROPORTIONS SHOULD BE TAKEN (CLASS B)

Copper and Lead-bearing Scrap	*Sample	Copper Per Cent High	Copper Per Cent Low	May Contain	Free Iron Per Cent High	Free Iron Per Cent Low
Ashes, all kinds	M-S	75	5	Pb		
Battery-plates	M	85	68	Pb-Sb		
Borings, all kinds	S-M	97	10	Sn	50	
Bronze powder	S	85	75	Sn		
Buffings, all kinds	S-M	65	9			
Carbon blocks and dust	M-S	79	69	Pb-Sn		
Cement copper	S	60	20		5	
Cobbings	M-S	25	15			
Concentrates, brass	M-S	70	5		10	
Copper cinders and clinkers	S-M	30	7			
Copper oxide and scale	S	95	45			
Copper ingots and pigs	D-M	99	85	Sn		
Drosses (Cu, Pb, Sn, terne, solder, babbitt and die-casting)	M-S			Sn-Pb	20	
Dusts, copper	S	85	15			
Fuses	M	60	30			
Filings	S-M	75	65		40	
Grindings	S-M	75	10		20	
Jack-strips	M	45	10		50	40
Lamp-bases	M	30	5			
Lead oxide and mud	S	70 Pb	45 Pb	Pb		
Lead sulphate	S	65 Pb	35 Pb	Pb		
Mattes	S	60	20			
Mud, foundry, rumbling	S	25	3			
Residues	S	40	25			
Shells, shotgun, brass, copper	M	70	25			
Shells, electrotype	M	50	30	Pb		
Screenings, siftings, sievings	S	70	45			
Skimmings (aluminum, brass, zinc sal-ammoniac)	M	73	7	Pb-Sn-Zn-Al		
Slags, all kinds	M-S	21	0	Sb-Pb-Sn		
Spatters	M	65	35			
Sweats	M			Sn-Pb-Sb		
Sweepings	S-M	65	25			
Tailings, separator, magnet	S	56	7			
Turnings, all kinds	M-S	99	23	Sn		
Washings	S	85	4			

*M = Melt; T = Matte; D = Drill; S = Screen.

for the sample. Large metallics should be picked out by hand, broken down, weighed and added in the proper ratio to the main portion. Certainly the men unloading should not be permitted to shovel here or there, taking a sample shovelful whenever or even wherever they may choose. The only justification for a percentage sample is in the regularity of taking it. A carefully taken grab sample is better than every fifth shovel taken haphazardly.

In all cases, half the final crude sample should be held as a reserve in case of dispute.

MOISTURE DETERMINATION

In general, the regular sample will suffice. If the material is sold with payment to be made on the original or "as received" basis, it is necessary to ascertain the moisture, if for no other reason than the probability that the reserve portion may either lose or gain moisture in storage, and, of course, it is always advisable to dry before charging into a crucible. If the sample is to be screened only, either the sample must be dried at 212° F. and the resultant assay run on the "dry basis" or else the sample may be burned with or without the addition of kerosene oil. In either case it may be calculated to the "original basis."

If material is sold with payment and treatment charges on a dry basis, a moisture test must be run. The usual practice is to take either the regular sample or a portion (weighing, say, 10,000 gm.) and dry either in an oven or by the furnace. The moisture determination, therefore, may be very important, for it may not only reduce the treatment charges through smaller weights but may throw the material into a higher schedule and consequent lower rate.

The moisture determination, in most cases, should be made by drying at a temperature about 212° F. Fine material is sometimes calcined, but while this shows a loss of other volatile and combustible matter as well as moisture, this loss may be partly offset by oxidation of finely divided metal. As a matter of fact, material like copper cements and some mattes will show first a loss, but finally a gain when dried at slightly over 212° F.

Copper oxide or mud from wire or cable may contain both water and oil or grease. The samples are generally first dried and then burnt. Such moisture determinations are often unsatisfactory.

ELIMINATING OIL AND GREASE

In the sale of turnings, etc., for remelting purposes, the matter of oil and grease is often an issue. A 5 or 10 per cent. sample is taken of thoroughly mixed material, coned, quartered and remixed and placed in a container, preferably a bottle. When sold to a smelter, this class usually calls for burning the sample. Before and after burning weights must be taken. When sold to a brass foundry the turnings should be washed, first with alcohol and then with ether, before analysis, the loss in weight being ascertained.

REMOVING IRON

Whenever possible, free iron should be removed with a magnet or by hand before melting. If the sample is one that admits of screening, it is best to pick out by hand the larger pieces and use the magnet only on the coarse scales or metallics. If used on the fines, values may be removed at the same time, especially if oily. If the iron is attached to the other metals, as in armatures, generators, bed-rods and the like, it is sometimes possible to sweat the material. When necessary to actually melt the other metals, the iron should be taken out by skimming; it should always be weighed and the weight included in the sampling data given on the bag. Unless carelessly done, the "wash" or copper adhering to such iron can be disregarded. If the material cannot well be sweated or melted into a good bar, the whole sample should be melted with the addition of sufficient sulfur to form a clean low-grade matte. This is especially advisable on material containing more iron than copper and in copper-clad steel.

This article will be continued in an early issue.—Ed.

Applied X-Rays in the Metal Industry

How X-Rays Help to Test Metal Products

By HERBERT R. ISENBURGER

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

The inspection of the rough structure of metals by means of X-rays serves to discover slags, shrinkage, blow holes and the like in unfinished, semi and manufactured products.

The method is based upon the capacity of X-rays to penetrate materials. Inasmuch as the penetrating power decreases quickly with increasing atomic weight of the material, even small enclosures and air bubbles can be recognized easily. The material under investigation is to be placed between the focus of an X-ray tube and the photographic plate or fluorescent screen respectively, where the focus of the tube produces a "shadow picture" of the piece under investigation.

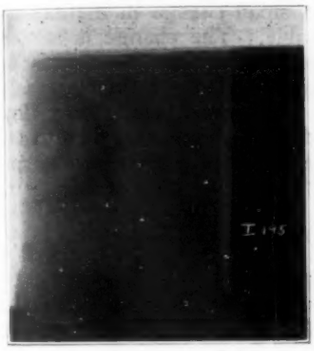


FIG. 1—CAST BRASS BAR, SLIGHTLY POROUS TOWARD THE EDGE

This enables us to examine materials in all states of manufacture without causing any mechanical or chemical change or even destruction. The diminishing strength of the rays while penetrating materials, limits the inspection. In practical routine examination we obtain good details in radiographic inspection of bronze up to 2 inches thick, iron up to 3½ inches and aluminum up to 12 inches; for inspection on the fluoroscopic screen the limits are for bronze at about ½ inch, iron 1 inch and aluminum 4 inches. The appearance of faulty conditions is almost the same for the different materials and can be raised up to 0.3 per cent precision in radiography and up to 4 per cent in fluoroscopy; this statement holds good for blow holes in the direction of the rays in per cent of the entire thickness of the material in the same direction. Straight, smooth shapes are more suitable for our investigations than complicated ones with different thicknesses which require skilled technique.

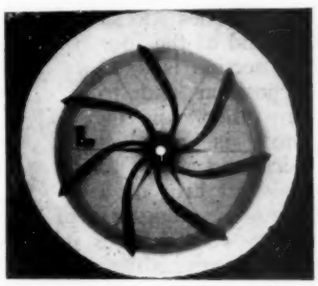


FIG. 2—VACUUM CLEANER FAN WHEEL

Showing characteristic porosity of an aluminum die casting. L is a marker placed so as to identify location of interior defects

It is of great importance to have full protection of the photographic plate against scattered radiation. The time of exposure decreases with increasing voltage, because you do not get as much details in your exograph with a high tension as you would obtain with lower voltage and somewhat longer exposure. The following scale gives practical exposure time for bronze, iron and steel, and aluminum products. The tects were made with a duplitized film and two intensifying screens with a focus distance of 16 inches from the film. The last column shows the current in 1/1000 amperes multiplied with the exposure time in minutes.

Continuous current kilo-voltage	Thickness of the material under investigation Bronze	Iron	Aluminum	Exposure time —Amp. x min.
95	⅜″	1″	6¼″	240
115	⅝″	1⅛″	8¼″	200
130	⅞″	1½″	9½″	200
185	1½″	2⅜″	13″	160
230	2″	3⅛″	15¾″	80

The most important practical application of X-rays in the metal working industry are the following:

1. Examination of cast blocks and bars before rolling or drawing to determine impurities and porosity. Figure 1 shows a brass cast bar about 1 in. thick; there is slight porosity in the body of the specimen and considerable more toward the edge. The latter is somewhat observable in the fractured face. Surface variations have been pretty well suppressed by use of liquid absorber.

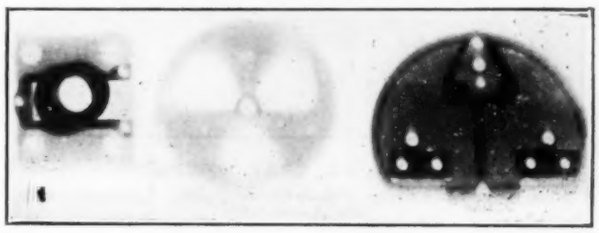


FIG. 3—SEVERAL ZINC DIE CASTINGS. LIGHT SPOTS INDICATE BLOW HOLES

2. Examining pipes or cables for shrinkage or cracks from overdrawing.

3. Inspection of high pressure machine parts (cylinders and pistons, boiler plates and the like) before fitting in, or inspecting expensive steel castings before machining.

4. Control of welded and soldered seams.

5. Fluoroscopic inspection of die castings. A slightly porous aluminum casting (vacuum cleaner fan) is seen in figure 2 whereas figure 3 shows a few zinc castings, white spots indicating air bubbles. In connection herewith, figure 4 shows a brass tubing. A series of almost connected little cavities are seen in the middle of the casting, none of them could be seen on the surface.

FIG. 4—BRASS CASTING

Exograph renders visible very bad conditions within the cast body, whereas the surface is equally smooth

6. To ascertain changes within heavy duty materials like propellers made of aluminum or wood. For more pertinent facts we refer to an extraordinarily well written book, "X-Rays, Past and Present," by Pullin and Wiltshire, which is obtainable at the Public Library.

A small outfit is shown in figure 5, consisting of an alternating current apparatus combined with a Coolidge

tube table supporting the tube as well as the camera.

Before installation of an equipment a critical examination of the suitability of X-rays for the individual purposes by a consulting expert and practical tests should be made. The costs for an X-ray installation range from

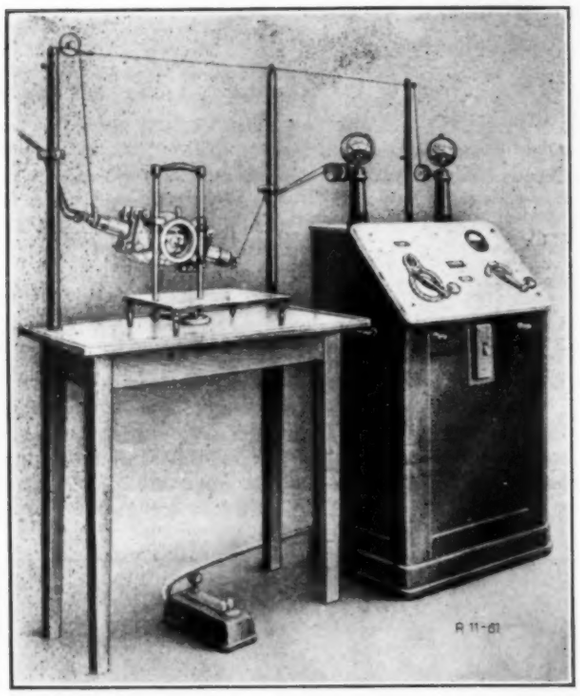


FIG. 5—SMALL X-RAY EQUIPMENT

High power transmission with instrument board; X-ray table with tube in lead cover

$1,000 to $8,000 which, in many cases, would pay for itself in a year.

For practical inspection work with a fluorescent screen a special constructed outfit is available whereby the castings pass on a conveyor belt right through the X-ray field. One checker will be able to inspect the entire output before leaving the plant, because the inspection only affords a few seconds for each piece and some hundreds can be dealt with in an hour. Such an equipment has proved of special value in the manufacture of die castings and light brass castings.

Paris Observes Nickel Week

The city of Paris, France, recently observed "Nickel Week," during which there was held an important symposium on nickel. Many metallurgical papers were presented, as well as some interesting material on the subject of nickel plating.

One paper, read by M. Galibourg, included a new nickel plating formula, said to be different from the so-called American formula. It comprises nickel sulphate, 450 grams; nickel chloride, 22 grams; boric acid, 22 grams; nickel nitrate in 20% solution, 1 cc.

The paper states that the operation should be carried on at a temperature of 50° Centigrade, with agitation by bubbling air that is previously purified with caustic and sulphuric acid. It is stated that by this method deposits of 0.01 to 0.025 mm. may be obtained in 15 minutes, as compared with 2 hours necessary in the solution hitherto used.

Measuring a Billionth of an Inch

Equipment to measure changes in length of the order of a billionth of an inch has recently been devised by P. P. Cioffi of Bell Telephone Laboratories. This length is just about a tenth of the diameter of an atom.

The need for so refined an instrument arose from studies of magnetic materials. Until recently it had been thought and taught that pure iron was the most magnetic material it was possible to obtain. When G. W. Elmen of Bell Telephone Laboratories discovered permalloy, all previous theory was overthrown. This is an alloy containing seventy-nine per cent nickel, and twenty-one per cent iron, which has magnetic qualities far superior to pure iron alone. An immediate effort was made to build up a new theory to account for the remarkable properties of permalloy. Dr. L. W. McKeehan of the Laboratories' technical staff undertook the work. Two fundamental facts were available as foundational material. When a metal is magnetized a loss occurs which evidences itself as heat. In addition a small change in the dimensions of the metal is detectable. The change is almost inconsiderable, not over one part in 100,000, but is in opposite directions in iron and nickel; the former expands while the latter contracts in a magnetic field. Permalloy neither contracts nor expands and shows very little heat. The iron atoms acting in one way slip by the nickel atoms acting in another so that friction is at minimum.

It seemed desirable to determine how the facts bore out this theory. To carry on the investigation it was necessary to have a measuring instrument of greater delicacy than any in existence. The equipment was designed to measure changes of length in a piece of wire about four inches long. One end of the four inch section is fixed in position and to the other end a clamp is attached which connects to the short arm of a lever. The long arm of this lever tips a concave mirror as the wire changes its length. Light from an incandescent lamp, after passing through a suitable lens, falls on the mirror at a small angle from the perpendicular and is reflected back to a position somewhat offset from the lamp where a photo-electric cell is mounted. Between the light source and the mirror is a grating with alternate opaque and transparent lines, each half a millimeter thick. The image of this grating falls on the mirror and is reflected back to an extension of the same grating in front of the photo-electric cell. When the images of the transparent lines are reflected back to another group of transparent lines, full light will fall on the cell. When, on the other hand, they fall on the opaque lines no light will be transmitted. Only a very small movement of the mirror is required to cause this change from full light to no light. The photo-electric cell gives off a current proportional to the light falling on it, and this current is indicated by a sensitive galvanometer. Every precaution is taken to keep the temperature of the wire constant.

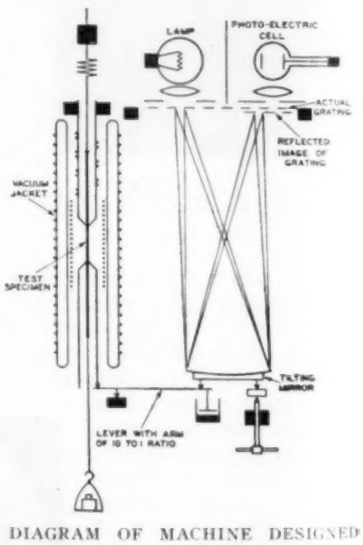


DIAGRAM OF MACHINE DESIGNED TO MEASURE BILLIONETH OF AN INCH

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THE ELECTRO-PLATERS' REVIEW

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Published Monthly—Copyright 1928 by THE METAL INDUSTRY PUBLISHING COMPANY

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year. SINGLE COPIES, 10 CENTS
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Vol. 26 New York, June, 1928 No. 6

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Editorial

Go to the Platers' Convention

This is the last call that we shall be privileged to make to platers and manufacturers to go to the coming convention of the American Electroplaters' Society in Toronto, Canada, June 25-28. When this issue reaches our readers there will be only about two weeks in which to make the necessary preparations. We urge that no time be lost.

The question at issue is not "Why should we go to the convention " but rather, "Why should we not go to the convention?" The plating industry is growing, new methods are being developed everywhere, old lines are being crowded out and replaced by new ones with special finishes and greater attractiveness. One of the most important sales arguments today is the beauty and durability of the finish, and there is no place where more can be learned about finishes than at the platers' convention. Is your equipment out of date? There will be an exhibition of supplies and equipment by the leading supply houses. Are you unable to match the finish which your customer demands and which your competitor can produce? These finishes are likely to be discussed at the meetings and will certainly be discussed in private gatherings. Perhaps the foreman plater and superintendent cannot be spared from the plant. This reflects upon the organization which is such that it cannot run unless its executives are there every minute.

Has your plant had troubles in the past year? Have your solutions gone wrong? Has your work come out blistered, or has it peeled? Make a list of these problems and take them to the convention or send them with the man whom you send there and let him come back with the answers. Plenty of others have had similar experiences and they are more than willing to exchange remedies as well as to tell of their own troubles.

It will be a high-powered convention, full of profit for those who attend. The day has passed when delegates to a convention used the time for entertainment, at the expense of work. A glance at the program published on page 250 of this issue will show the vast amount of work which will be crowded into the four days.

Every plant doing plating and finishing work should have at least one of its men attending the 1928 convention of the American Electroplaters' Society.

The Foundrymen's Convention

There are nine elements which can be specifically named, and undoubtedly many more not so tangible, involved in the making of good castings: patterns, sand, molding, alloying, melting, pouring, cleaning, finishing and material handling. Those who wish may add to this list personnel management, wage payments, apprentice training, estimating, cost keeping, financing, and a host of others.

Most of the elements mentioned above were brought out at the 32nd annual convention of the American Foundrymen's Association, in Philadelphia, May 14-18, and the light of free discussion was brought to bear on them. A report of this meeting and abstracts of the papers bearing on metals are given on page 265 of this issue.

The non-ferrous sessions were of the highest order of practical value, covering, as they did, scientific control in the foundry, the effect of lead on brass, refractories for furnaces, the laying out of risers, and melting and pouring No. 12 aluminum alloy. The brass foundry round-table discussion was of the most direct and utilitarian character.

The convention as a whole was immediately worth while, including the exhibition of foundry equipment. It must be noted, however, that the absence of the Institute of Metals Division made a real difference, in quantity, to the brass men. The quality of the papers read was high, but all of the metal foundrymen would have enjoyed one or two additional sessions.

It seems to be traditional that brass foundrymen are peculiarly hard to bring out into the open. They will not tell their troubles or give up their "secrets." The free talk at the round table disproves this tradition, however, and it would be decidedly worth while for the Foundrymen's Association to bend every effort to get more papers on non-ferrous metals.

Names for Alloys

The question has arisen again of names for various mixtures, the old cry being heard for the simplification and proper nomenclature of alloys which will give some indication of their content.

Flagrant abuses have been and can be corrected by the Federal Trade Commission in cases where the name is actually misleading and tends to make consumers believe that the alloy contains valuable metals which are not actually included. This pressure cannot be brought to bear, however, against alloy makers in general, as in most cases the names are not such as to create these particular illusions. The trouble is not so much fraud, or even intention to deceive, but largely the nuisance involved by

the flood of new and meaningless names which have to be absorbed by the consuming public.

In addition, there is the time honored practice of calling certain complex brasses by the name "bronze." Manganese bronze, for example, is certainly not bronze but a very strong brass. Aluminum bronze has more excuse for having that term, but even there something should be done to differentiate it from the tin-bearing copper alloys. The name nickel silver, although an improvement upon German silver, really has no right to the name "silver" and should be called by some other, less misleading term. Nickelene, once recommended by the American Society for Testing Materials, or nickel brass, would do very nicely. An example of a well named material is nichrome, composed of nickel and chromium.

The subject has so many ramifications which have been discussed many times in these columns that it is impossible to bring them all to bear in the short space available. The trade seems to have been cured of one misnomer, however, namely spelter, which is now almost universally known by its true name, zinc. If the same efforts were exerted in other directions, similar results could be achieved.

American Metal Resources

There are two ways of looking at the metals which we produce and consume in the United States. One is the purely commercial aspect which is to mine as much as possible, at a profit and to get the best possible price for the output. The other is to consider them a national resource, limited in amount and to be conserved against future needs.

At this time in our industrial history we are faced with the fact that manufacturing is making enormous demands upon our natural resources. Few mines have a visible life of more than fifteen or twenty years. To be sure, in many cases, the visible life continues to remain at that figure, even though the mine grows older, due to the extensive development work which is constantly going on. In other words, a mine may have a visible supply of ore for the next ten years, but at the end of these ten years the operators have discovered enough new ore to last another ten years. This is so common that no one is perturbed at the seemingly short period of existence ahead of our metal resources.

Even though the consumption of metal is growing steadily year by year, there is no thought at this time of curtailing production and consumption in order to conserve metals for future generations. On the contrary, the pressure has been in the other direction, namely to increase the uses and outlets for all metals. Copper, zinc, lead, aluminum—all are striving for greater markets, and judged at least by market conditions, their problems are financial rather than otherwise in character.

The other aspect, namely that all metals should be conserved and reserved for necessities of this and future generations, is hardly tenable, at least under present conditions. At this time there is no immediate danger of a shortage that we can see. If this situation should arise, the prices of metals would immediately reflect such a shortage and, to a considerable extent at least, drive away users by their high cost. In times of national emergency the Government could always claim first right to indispensable metals as it did during the war. It can hardly be said that metals are being wasted simply because they are produced in such large volume. The fact is that every pound of them goes into something fairly permanent in character, and when that is worn out, the reclamation or scrap value of the basic metals is very high.

In this generation, at least, it would seem that the problem of metal production and consumption in the United States is largely economic in character, rather than social. The producers of metals must produce wisely; in not too large volume, as this would flood the market and make operation unprofitable; in not too small volume as this would create an artificial shortage, unreasonably high prices, and an immediate drift away from the use of their material.

Intelligent control, which it seems is actually being exercised in the copper industry, is the present answer to our metal problems. Then, if a shortage of resources really does appear imminent, we shall be adequately equipped with the necessary machinery to regulate production with a view to the conservation of a national asset which might be wasting too rapidly.

Technical Papers

The Use of Inhibitors in Pickling, by E. L. Chappell, B. E. Roetheli, and B. Y. McCarty, Department of Chemical Engineering, Massachusetts Institute of Technology, Boston, Mass. A paper submitted for presentation at the Spring meeting of the American Chemical Society, Division of Industrial and Engineering Chemistry, at St. Louis, Mo., April 16-20, 1928.

The addition of "inhibitors" to pickling acid greatly decreases the rate of attack on clean steel or iron, while at the same time permitting the rapid solution of the scale. The action of inhibitors has been given comparatively little theoretical study and the work reported in this paper was undertaken to investigate some of the factors involved. This study indicates that the action of the inhibitor is directly related to the raising of the hydrogen over-voltage on steel and gives comparative data for the action of a typical inhibitor on steel, wrought iron, cast iron, copper, and other materials. This relation is then described for a number of types of chemical substances which have inhibitive properties. A general theory of the mechanism of inhibitor action is suggested.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill } W. J. REARDON, Foundry; P. W. BLAIR, Mechanical; CHARLES H. PROCTOR, Plating Chemical

Bright Dip for Brass Castings

Q.—Please give us a bright dipping solution for small brass castings. We have about 12,000 of such pieces to clean.

A.—To produce a bright finished surface on small brass castings, proceed as follows:

Remove all burnt-in sand, either by wet tumbling or with the aid of a hydrofluoric acid pickle consisting of:

Water	1 gallon
Commercial hydrofluoric acid	1 pint
Sulphuric acid	4 ozs.

Either a part of an alcohol barrel or a small, lead-lined wooden tank is used for holding the pickle. It will eat through ordinary stoneware jars. The pickle should be heated to 120° F. with live steam. After pickling the castings for sufficient time to loosen up or dissolve any particles of sand or silica, wash the castings thoroughly in cold water and let them dry a little.

Next prepare a dip of nitric acid, 38°, in a stoneware jar, of sufficient volume to take fair quantities of the castings, which are immersed in this. Surround the jar with cold water to keep the acid cool. Immersion should last only a moment or two. Remove and wash thoroughly in cold water.

The day before the acid dipping operations are begun, the following bright acid dip should be prepared in sufficient volume for your purpose:

Nitric acid, 38°	1 gallon
Sulphuric acid, 66°	1 gallon
Water	1 pint
Muriatic acid	1 ounce

This should be put in a stone ware container which should be surrounded by running cold water. Solution should be mixed in the order given, then left to cool down over night. It will be ready to use the next morning.

After proceeding as outlined up to the nitric acid dip, then immerse the castings in the bright acid dip as given above. Keep them in a moment or two, with a swirling motion, then withdraw and wash thoroughly in cold water, then pass through a cyanide dip consisting of:

Sodium cyanide	3 ozs.
Water	1 gallon

After this, re-wash in cold water, then rinse in boiling hot water to each gallon of which has been added one ounce of Procter & Gamble's soap chips. Drain thoroughly and dry out the castings in maple wood sawdust. If castings are very small they may be strung on soft copper wires, or placed in quantities in aluminum acid dipping baskets to eliminated wiring. However, the aluminum baskets cannot be used in the hydrofluoric acid dip as it will dissolve the aluminum. The nitric and sulphuric acids have no perceptible effect on the aluminum. Vitrified stoneware baskets, with the largest holes possible, are the best all-round dipping receptacles. The result of this procedure should be the bright finish you want.—C. H. P., Problem 3,755.

Cleaning Brass Radio Parts

Q.—Please advise me how I can clean brass radio parts, such as condensers, without using any acid dipping. The condensers contain soldering flux and vaseline grease, and are very badly discolored from the soldering flux. They have to be cleaned by girls and we do not want to use any dangerous chemicals, such as strong potash or acid.

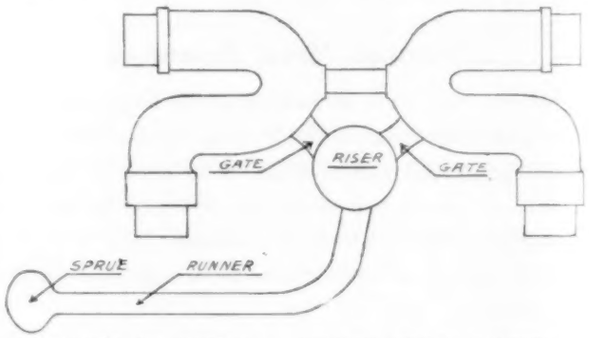
A.—There is no method of producing a bright clean surface upon brass that equals the bright acid dipping process unless the brass is buffed under usual conditions. It is an easy matter to remove the grease from the condensers with a mixture of 2 parts carbon tetrachloride and 1 part naptha spirits or benzol. This mixture is non-inflammable and is safe for use by girls.

After immersing the condensers in the above mixture, they can be dried out atmospherically. When dry, immerse in a solution of water 1 gallon and sodium cyanide 4 ounces, heated to 120° F.; or a solution consisting of 1 part muriatic acid and 4 parts water can be used, heated to the same temperature. Either the cyanide or muriatic acid solution will remove the oxide, which results from the heat applied in soldering. Afterwards, wash the condensers in hot water, immerse in the carbon tetrachloride-benzole solution, and dry out atmospherically. You will not be able to produce a finish on the condensers equal to the bright acid dip finish, however.—C. H. P., Problem 3,756.

Dross in Brass Castings

Q.—We are sending to you under separate cover by parcel post two castings. One shows the way we have the pattern gated. We would like to have you take notice how slaggy the castings are; one casting is partially polished showing pits. Can you suggest a way for us to overcome this trouble?

A.—On examination of the sample castings we note you are using aluminum in your metal. Aluminum is a very good flux



METHOD OF GATING A YELLOW BRASS CASTING

for yellow brass. It suppresses zinc fumes and gives fluidity to the metal, thus making it much easier to produce good castings free from cold shots and misruns. Aluminum, however, added to yellow brass has one great drawback. It causes excessive drossing and it is this dross that is responsible for your trouble. This can be overcome to a great extent by a method of gating. We suggest you change your gates as per the sketch. The idea is to give the metal a long run so it will run into the mold without agitation. If you can do this it will avoid drossing and eliminate your trouble. A better method would be to use a scrap brass mixture without aluminum, higher in copper, called scrap red brass, or a new metal mixture composed of 74 copper, 22 zinc and 4 lead. However, changing the gate will help.—W. J. R., Problem 3,757.

Coating Copper with Lead

Q.—I am interested in the coating of copper sheets with lead, for roofing purposes. Will you kindly advise me where I can get complete data on this material, as well as any information regarding the process of applying the lead to the copper sheets?

A.—Coating any metal with lead is somewhat of a problem. Tin, zinc and lead-tin alloys are comparatively easy as compared with lead. The following would be your procedure from a practical standpoint.

The copper sheet would have to be clean and free from oxidation.

The usual alkaline cleaning would be necessary, followed by water washing and removal of any oxide by the aid of either sodium cyanide or sulphuric acid dips and re-washing in water. After cleansing, the sheets must receive a light amalgamation from a mercury dip, preferably composed as follows:

Water	1 gallon
Mercuric chloride	4 ozs.
Nitric acid	1/16 oz.

The addition of 4 ozs. sal ammoniac may prove an advantage. The sheets when thoroughly drained should be immediately immersed in a concentrated solution of water 1 gallon and sal ammoniac 3 pounds. Drain well and immerse in the molten lead bath, which should be covered with tallow to the depth of half an inch or more to prevent oxidation of the lead.

After coating the copper sheet with lead, cool it in kerosene oil or water heated to 120° F., to which is added about 4 ozs. sal ammoniac per gallon.

In experiments we have previously made, the procedure as outlined has given the best results. We suggest that you make tests accordingly upon a minor scale.—C. H. P., Problem 3,758.

Gold Plating by Immersion

Q.—We are manufacturing ruling pens made of bronze, which we desire to coat with gold by dipping. However, we find that the finish comes out tarnished, as you will see in the sample we are sending you. How can this be remedied?

A.—It is obvious that you are not getting enough gold on the pens. We recommend either of the gold dipping solutions mentioned on page 17 of PLATER'S WRINKLES. These will give you a satisfactory dipped gold finish.

There is one important fact, however, that should be remembered in connection with immersion gilding. That is that every pen dipped will remove a certain amount of the gold in the solution. Thus, if you dip a hundred pens at a time, it will take out a hundred times as much gold as one pen would carry off. The gold must not be allowed to diminish too far, otherwise the results will be poor. That is probably why your pens have become tarnished. They have not gotten enough gold. A very concentrated gold solution should be prepared from sodium gold cyanide, which is soluble in warm water. A determined amount of this concentrated, or stock, solution should be put into the solution in drops every time a batch of pens is removed. By this method you will be able to maintain a uniform gold concentration in the solution and get a uniform coating on the pens. As an added precaution, to prevent tarnishing, the pens might be tumbled in sawdust moistened with olive oil.—C. H. P., Problem 3,759.

Plating 18-Karat White Gold

Q.—We need a formula for nickel plating 18-karat white gold rings and mountings. Can you supply such a formula?

A.—Nickel deposits are no longer being used for plating 18-karat white gold rings and mountings. The old method of a flash coating of nickel, tin and cadmium has been supplanted by a chromium deposit. This has a closer resemblance to the white gold, is hard, and retains its lustre indefinitely. A chromium solution which is not patended and which you can use for your purpose to good advantage is prepared as follows:

Water	1 gallon
Chromic acid	16 ozs.
Chromate of iron	⅓ oz.
Chromium sulphate	⅓ oz.
Concentrated C. P. sulphuric acid (Measured accurately)	15 drops

Use sheet steel anodes; 5 to 6 volts of current; keep solution at temperature of 115° F; plate for one to two minutes.

In preparing the solution, dissolve the chromic acid and the chromate of iron in one quart of water heated to 200° F. Dissolve in one pint of water at same temperature the chromium sulphate and when completely dissolved add it to the solution first prepared. Next add the balance of the water to make one gallon or, proportionately, as much as you desire to use. Finally, add the sulphuric acid, drop by drop, not exceeding the quantity stated above. The solution is then ready for use. Care must be exercised in making perfect contacts with the anodes as well as with the work to be plated.

If you desire to nickel plate the articles, use the following solution:

Water	1 gallon
Single nickel salts	12 ozs.
Cobalt chloride	2 ozs.
Boracic acid	1½ ozs.
Epsom salts	8 ozs.

Dissolve the single nickel salts, cobalt chloride and boracic acid in one-third of the water at boiling temperature; add one-third more of the water cold; and in the remaining one-third of the water, at 180° F., dissolve the epsom salts. Then mix the solution together throughly. Operate it cold, at 3 volts. Under ordinary plating conditions the time required is two minutes.—C. H. P. Problem 3,760.

Questions on Plating Practice

Q.—Will you please give me advice on the following problems:

1. I find that when I apply the regular amount of current to my silver solution, the plated articles turn dark, making them hard to scratchbrush, but when the current is turned down, the articles remain white. Does this mean my solution needs something? Those that are farthest from the rheostat turn dark first. About 4 months ago I added ½ oz. of ammonium chloride to the solution.

2. If I put some nickel anodes in the silver solution, will the ordinary voltage be sufficient? Can the work be oxidized just the same if nickel anodes are used together with the silver?

3. Is hard water detrimental to a nickel solution? Our water is very hard. If a softener is needed, what shall I use?

4. My nickel solution for plating die castings is made up of 9 oz. single nickel salts, 2 ozs. ammonium chloride, 2 ozs. boric acid, 14 ozs. sodium sulphate (anhydrous). The only trouble I have had is a little peeling, generally on the first load in the morning. It gives a hard deposit, too. The solution is just what I want for die castings. Do you think it is too viscous? The acid just barely shows in litmus paper tests. If I heat this solution to 75 to 80 degrees Fahrenheit, it will never peel. That, however, is a lot of trouble for me as I have no efficient heating apparatus.

5. The die cast metal I plate consists of 92 zinc, 4 aluminum, 3 copper and a trace of magnesium. I have tried eight different cleaners. Is there one that will not turn the metal black in 4 to 5 minutes? The best I have found consists of 2 ozs. soda ash, 2 ozs. tri-sodium phosphate, ½ oz. copper cyanide, 1 oz. sodium cyanide. I wash the work in gasoline before giving it a ½ minute copper flash. What causes minute blisters to appear on nickel plated die castings?

A.—1. There is insufficient free cyanide in your silver solution. Add one ounce or more per gallon of solution. We presume you have enough silver in the solution and ample anode surface. Avoid the use of a very high voltage as it results in burned, hard deposits. Do not exceed 2 volts.

2. Nickel anodes can be used in a silver solution. They reduce very slowly. If a small addition of ammonium chloride is made, chlorine will be liberated at the anode and will help reduction. The maximum amount ever deposited, however, does not exceed 5%.

3. Very small amount of sodium perborate added to the water with which you replenish the nickel solution will be found of value. Use about ¼ oz. per gallon. It will soften the water and will not hurt the solution. On the whole, hard water is not injurious to a solution.

4. There is no advantage in using such a high content of sodium sulphate in the nickel solution. Half the amount would have been plenty. Peeling may be due to hydrogen. The sodium perborate addition should have overcome the trouble; about ⅛ oz. per gallon dissolved in just enough warm water to make a solution, then an addition of enough muriatic acid to give the solution an acidity equal to the acidity of the plating solution.

5. We do not believe you can improve your present method of cleansing the die castings. Since you have tried eight cleansers and now have one that is fairly satisfactory, why change? Half the trouble that develops in nickel plating die castings is due to hydrogen gas occlusion which is caused by imperfect cleaning. Hydrogen produces the minute blisters you mention. They usually appear several hours after plating. Your present procedure is correct and you should continue it.—C. H. P., Problem 3,761.

Patents

A REVIEW OF CURRENT PATENTS OF INTEREST

1,658,757. February 7, 1928. **Metal Composition.** Karl Bernhoeft, Oberschoneweide, Germany, assignor to General Electric Company, a Corporation of New York.

A metal composition containing about .1 to 1 per cent of copper, .05 to about 3 per cent of cadmium and the remainder aluminum.

1,659,984. February 21, 1928. **Wiper for Coating Machines.** Lawrence C. Steele, Baltimore, Md. A wiper for wiping the surface of the rolls of a metal coating apparatus consisting of a core of asbestos strands having a metallic reinforcing thread and a sheath of asbestos fabric.

1,660,159. February 21, 1928. **Production of Alloys of the Platinum Group.** Ernst Haagn, Hanau-on-the-Main, Germany, assignor to W. C. Heraeus Gesellschaft mit beschränkter Haftung, Hanau-on-the-Main, Germany. An apparatus for melting small bodies of pulverized metals in the electric arc, consisting of a supporting plate of calcium oxide and means to apply one electrode parallel and adjacent to the surface of the plate and the other electrode diagonally opposite the first electrode.

1,660,220. February 21, 1928. **Copper Refining.** Anthony G. De Golyer, Brooklyn N. Y. The method of producing copper which is entirely free from dissolved or occluded gas and entirely free from oxygen compounds which comprises reducing the oxygen content of the copper, while molten, by reaction of carbon with the oxygen of the bath to a point above the critical oxygen percentage at, and below which carbon monoxide is retained in molten copper.

1,660,558. February 28, 1928. **Method and Apparatus for Coating Metal Articles with Metal.** Wilson T. Herren, Barrington, Ill. A process of coating pipe with metal of lower melting point which consists in dipping the pipe in a bath of the molten coating metal, raising it from the bath into an inclined position revolving the pipe while in such position and projecting a cooling fluid against it thereby lowering the temperature of the coating metal below its melting point and permitting the pipe body to cool more slowly.

1,660,661. February 28, 1928. **Rustproofing Material and Process of Making the Same.** Hobart H. Willard, Ann Arbor, and Matthew Green, Detroit, Mich., assignors to Parker Rust-Proof Company, Detroit, Mich. A rust-proofing material consisting of a granular or powdery substance, the major portion of which is manganese dihydrogen phosphate.

1,660,667. February 28, 1928. **Method of Separating Cyanides from Mixtures.** Guy H. Buchanan, Westfield, N. J., assignor to American Cyanamid Company, New York. A method of separating the cyanide from the chloride in a mixture containing sodium cyanide and chloride which comprises evaporating a solution thereof until about 50% of the chloride present is precipitated, removing the chloride and again evaporating the solution until about 40% more of the chloride is precipitated, removing the chloride and evaporating the mother liquor.

1,660,805. February 28, 1928. **Method of and Apparatus for Electrobrazing.** Hector E. Moineau, Marlboro, Mass. The method of electrobrazing wire rods to sheet metal shells, which consists in clamping the parts together with a brazing metal and a flux between them, then passing an electric current between said parts via the flux and brazing metal, distributing the feed of current to the sheet metal to preclude local overheating and concentrating the heating of the rod by localizing the feed of current thereto.

1,660,847. February 28, 1928. **Method of Coating Metal.** Edwin Ross Millring, Orange, N. J., assignor to American Machine & Foundry Company, a Corporation of New Jersey. The series of steps in a method of coating metal, which consists in preparing a bath of molten lead containing tin only to increase its solubility of phosphorus, and thereafter adding phosphor lead to the molten lead and tin.

1,661,052. February 28, 1928. **Solder for Aluminum and Aluminum Alloys.** Gotthilf Schuldt, Stuttgart, Germany. A solder for aluminum and aluminum alloys consisting of 450 parts aluminum, 370 parts tin, 180 parts zinc, 20 parts copper, 15 parts of silicon, 10 parts of lithium or silumin, and 5 parts of iron, as set forth.

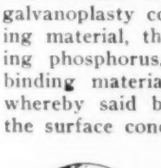
1,661,083. February 28, 1928. **Alloy of Copper, Tin, and Nickel.** Rudolf Ozlberger, Vienna, Austria. An alloy of copper, tin and nickel consisting of about 92.45% of pure copper, 7.3% of tin and 0.25% of nickel.

1,661,517. March 6, 1928. **Metallizing Process.** Julius Von Bosse, Leipzig, Germany. The process of metallizing textile fibres with gold which comprises subjecting the fibres in a vacuum to the action of a cooled radiating gold plated cathode.

1,661,526. March 6, 1928. **Process of Refining Light Metals Such as Magnesium or Aluminum or Their Alloys and Recovering Such Metals from Scrap.** Adolf Beck, Bitterfeld, Germany, assignor to the Firm I. G. Farbenindustrie Aktiengellschaft, Frankfort-on-the-Main, Germany. The process of refining light metals such as magnesium or aluminum or their alloys, which comprises melting the impure metal to be treated, adding calcium chloride and calcium fluoride in such proportions that the proximity of the eutectic point—82% of calcium chloride to 18% of calcium fluoride—is avoided, stirring the mixture and separating the molten metal from the foreign substances.

1,662,008. March 6, 1928. **Process of Coating Metals.** William Henry Legate, West Hartford, Conn., assignor of one-half to Edwin E. Sage, Hartford, Conn. In the art of plating, the process for increasing the thickness of a piece of material while in its embryo state and which material when completed assumes a different configuration, said process consisting in applying to the piece of material to be thickened, a shield of a design similar to the embryo material to completely overlie the material with the exception of cut-out and cut away portions of the shield, then spraying a material having an affinity for the thickening material to the exposed portions of the piece of material to be thickened.

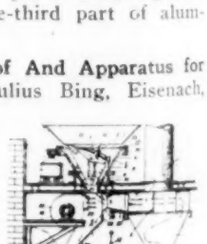
1,662,430. March 13, 1928. **Art of Incrusting Galvanoplasty and the Object Produced Thereby.** Frederick Maas, New York, N. Y., assignor, by mesne assignments, to Natural Flower Metalizing Co., Inc., New York. The art of galvanoplasty comprising first coating an object with stiffening material, then coating said object with a base containing phosphorus, rubber, asphaltum, carbon bisulphide and binding material, coating with silver nitrate on said base whereby said base reacts with the silver nitrate to render the surface conductive, and then electroplating said object.



1,665,435. April 10, 1928. **Non-ferrous Casting.** Ralph L. Binney, Toledo, Ohio, assignor to The Binney Castings Company, Toledo, Ohio.

A refractory alloy of approximately one part manganese, two parts zinc, eighteen parts copper, and one-third part of aluminum.

1,665,806. April 10, 1928. **Method of And Apparatus for Disintegrating Bulky Scrap Metal.** Julius Bing, Eisenach, Germany, assignor to the firm Magnet-Werk G. m. b. H. Eisenach Spezial-Fabrik für Elektro-magnet-Apparate, Eisenach, Thuringia, Germany.



A method of disintegrating scrap metal, more particularly turnings, consisting in this, that the material to be disintegrated is first only partially disintegrated, that the foreign bodies contained in the material, which interfere with the disintegrating process, are separated out by means of a current of a fluid medium and that the disintegration is thereupon completed.

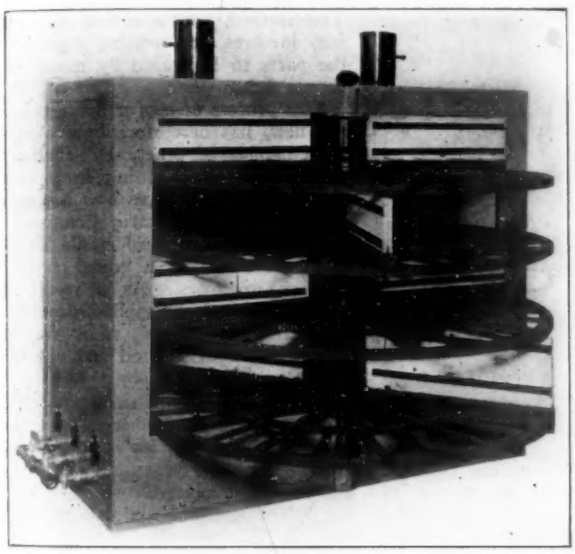
Equipment

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Revolving Core Ovens

A revolving core oven, particularly adapted to the baking of cores of small size, and having a number of distinctive features which, according to the manufacturers, gives the oven certain advantages, was displayed at the equipment exhibit held in conjunction with the convention of the American Foundrymen's Association, at Philadelphia the week of May 14, where it attracted considerable attention.

The oven is manufactured by The Monarch Engineering and Manufacturing Company, Baltimore, Md., furnace and fuel engi-



REVOLVING CORE OVEN

neers and builders of metal melting and other foundry equipment. The following are among the advantages claimed for the Monarch revolving core oven:

It can be operated with either gas or oil and provides an even distribution of heat constantly. It is easily controlled. It is equipped with oilless ball bearings and is fully insulated with asbestos.

It can be provided with any number of separate shelves as desired by the user.

It is stated that these ovens are built in a variety of sizes, running both smaller and larger than the model shown in the illustration, which measures 5 ft. 3 in. in diameter.

Ahcoloid Metal Cleaner

The Apothecaries Hall Company, Waterbury, Conn., has perfected and recently marketed a new cleaner which they call Ahcoloid Metal Cleaner No. 4. For some time there has been a need in the chromium plating industry for a fool-proof cleaner which would uniformly, as well as efficiently, clean all work to be nickel plated and subsequently chromium plated, the company states. Following a thorough study of this problem, Ahcoloid No. 4 was compounded to meet this need.

By observation and practical application, it is shown that on objects cleaned with Ahcoloid No. 4 and nickel plated, any tendency of the chromium plate to peel is reduced to a minimum. Best results are obtainable when used with the electric current. Economies in initial cost and curtailment in expense of consequent upkeep are indicative of this cleaner's practicability and merit, it is stated.

Exhausters for Artificial Draft

Many chemical operations on an industrial scale involve the moving of a more or less large volume of acid gas through a system of pipes, chambers, towers, etc. It is now generally admitted that for such operations, natural or chimney draft is undesirable. Uniformity of operation is impossible where the draft may vary from hour to hour with fluctuating, atmospheric conditions. Where artificial draft is provided the operation is under complete control and furthermore the installation or any part of it may be operated under a plus pressure.

The capacity of a plant in which a chemical reaction between gases takes place (as in the operation of chromium plating solutions and other plating and dipping substances for metals) may frequently be increased, it is said, by the use of an exhauster. The problem of the removal of a large volume of atmosphere containing noxious fumes is frequently met in metal working and finishing plants, particularly those where electroplating, rustproofing and the preparation for these processes are performed.

Under such circumstances, artificial draft is usually the only means of ventilation and is invariably the most efficient, according to a pamphlet prepared by the General Ceramics Company, 30 Church Street, New York, which includes in its line chemical ware exhausters and injectors for use in such ventilation needs as are described in the foregoing paragraphs.

This company's fume-exhausting equipment features a chemical stoneware lining to prevent damage to the exhauster while in operation on corrosive gases. One of the machines is shown in the

G-C EXHAUSTER ON BASE

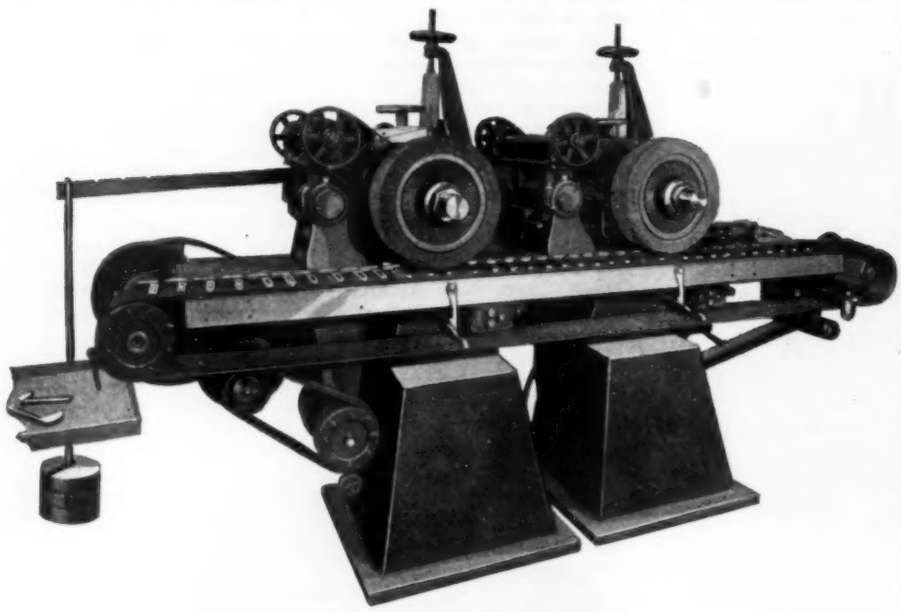
accompanying illustration. It is said to be suitable for electroplating, rustproofing, dipping or other work where fumes are generated and must be drawn off to protect the workers and increase efficiency. The company makes the following claims:

The G-C exhauster is lined with chemical stoneware which is housed in an iron casting and set on an iron base. The complete shell of iron around the stoneware housing protects the latter from damage due to external causes. The impeller is made of stoneware and mounted on a steel shaft which is protected from corrosion by a stoneware sleeve. The sleeve is ground accurately where it passes through the housing, insuring, smooth operation. Impellers are tested to 50 per cent above maximum working speed before being assembled in machines, thus preventing damage under normal operating conditions. The machine can be driven either

by a belt or by direct connection to electric motors with flexible couplings. The shafts run in ball bearings. Spare parts are available for replacement.

Automatic Polishing Machines

Rapid development is being made in automatic polishing and buffing of flat surfaced articles or those of regular contour, with or without the use of formed face wheels of canvas or leather. Where necessary to lift over sharp edges or surfaces not to be finished, automatic lifting cams are provided. The old type of automatic machine had several faults, which, it is claimed, have been corrected in the latest automatic polishing and buffing machine made by Divine Brothers Company of Utica, N. Y. These machines are now in successful use throughout the country, on automobile bumpers of all shapes, on pliers, wrenches, sewing and



AUTOMATIC POLISHING MACHINE

computing machine parts, refrigerator trimmings, automobile running board mouldings, windshield and top bars, planes, lock forgings, and flat stock of various descriptions, it is stated.

The polishing heads with counterweights are set longitudinally to the feed table, and can be so accurately balanced that they will swing at the slightest touch like a clock pendulum, and the pressure can be varied at will. Over the work table is a heavy feed belt, offering a resilient pad under the work, which automatically adjusts to slight irregularities or wind in the work. This belt has variable adjustable speed, and allows of placing the work in a continuous line without loss of productive space. The machine is of unit construction, 1 to 18 units, 4 feet to 120 feet long, with feed belts from 8 in. to 48 in. wide for various widths and classes of stock. Practically any finish required can be obtained by varying the number of units and the density of compress wheel and kind of abrasive used, it is claimed. On small articles, from 100 to 200 per minute can be completely finished in one operation, and piece work costs reduced to from ¼ to ⅛ of the cost of hand work. At the same time, dimensions and edges are much more accurately maintained than in hand work.

World's Finest Wire Cloth

A world's record is claimed by the Newark Wire Cloth Company, Newark, N. J., for making a wire cloth having 160,000 square openings per square inch, which is said to be the finest wire cloth ever made. It is a "400 mesh" wire cloth with 400 parallel wires per inch of width running each way, at right angles. In a piece of this wire cloth slightly more than 6 square inches in area, there are one million holes. Heretofore the finest wire cloth ever made in the United States has been 325 mesh and it, too, is made by the Newark Wire Cloth Company. It is known as Sieve No. 325 by the U. S. Bureau of Standards, and has been adopted as standard by the American Society for Testing Materials. Some ten years ago the United States Bureau of Standards in investigating testing screens, said that it seemed impossible for American manufacturers to successfully manufacture wire cloth with meshes finer than 100 to the inch, and that wire cloth with finer meshes had to be imported. For a long time previous to this, all of the fine wire cloth on sale in the United States came from foreign countries. At that time 325 mesh was the finest made, and 250 mesh was the finest produced in the United States.

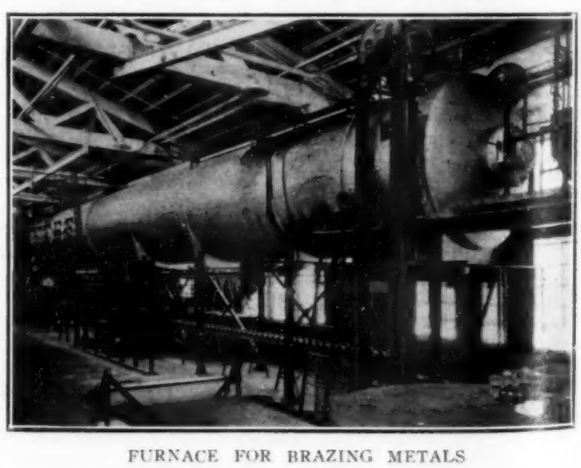
Brazing in Atmospheres of Gas

By the use of atmospheres of protective gas in electric furnaces, steel parts used in the manufacture of complicated assemblies can now be conveniently united by a strong alloy weld which would be exceedingly difficult to accomplish by other means, according to an announcement by the General Electric Company. This method, known as hydrogen brazing, involves the welding together of the parts to be joined by means of a copper flux.

This process of copper brazing, while not new, has heretofore been attended by a number of practical difficulties in application. Marked improvements in the equipment used are now announced by the General Electric Company, in whose laboratories considerable development work has been going on for a number of years. As a result, the method may now be applied successfully to many operations with resulting simplification of method and reduction of costs.

Electric furnaces of small size, utilizing protective atmospheres, have been used in laboratories for brazing by this method for some years. The theory of the process involves the reducing action of a hydrogenated atmosphere, which thoroughly cleans the surfaces to be joined, and the capillary attraction of the fluid copper, causing it to diffuse quite generally over the surface and to be drawn into the minutest joints between the parts. The protective atmosphere is essential during the cooling portion of the cycle also.

A typical hydrogen brazing furnace used in the Schenectady plant of the General Electric Company consists of three "stages." Each stage is in the form of a platform. Covers which may be



FURNACE FOR BRAZING METALS

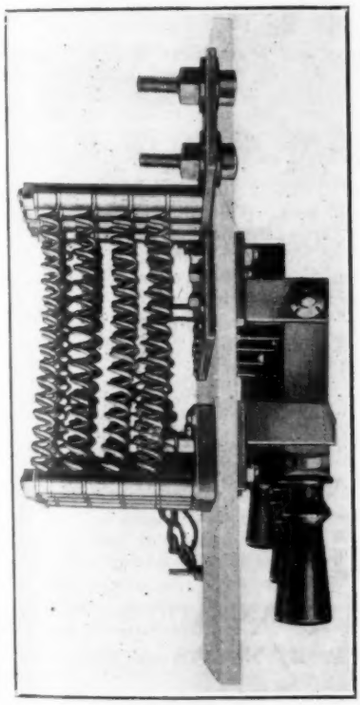
raised and lowered are provided for two of the stages. The work to be brazed is first assembled on one stage, copper wire or chips being placed adjacent to the joints to be united. The assembly is then placed in the heating chamber at a suitable temperature, and the next stage loaded. When the first assembly has been suitably

heated over a predetermined period of time, it is withdrawn from the heating chamber and placed in a cooling chamber, the second assembly automatically moving into the heating chamber. Thus the heating, cooling and assembly may all take place at the same time.

Another application on which the protective gas envelope is used to advantage is bright annealing steel in sheet or fabricated form, for nickel, Monel and certain other non-ferrous metals, to save the cost of annealing pots, handling, pickling, etc. In such work, a furnace of the continuous type shown in the illustration is used. It is designed for larger output. The work is loaded on suitable trays arranged to be pushed through the furnace on a roller track. An elevator raises the trays into the furnace at the entrance end and a similar elevator is used to remove them from the discharge end. A hydraulic cylinder is used to push the work through the furnace. Heating takes place in only one portion of the furnace, the remainder being provided with a water jacket for cooling; thus the work is both heated and cooled in the protective gas atmosphere.

Rheostats for Electroplating

The Hanson-Van Winkle-Munning Company, Matawan, New Jersey, has recently developed an improved type of plating tank rheostat known as "Optimus." These rheostats afford absolute regulation and control of plating baths, and simplify the operation of all plating solutions, whether chromium, nickel, copper, brass, cadmium, zinc, tin, gold or silver, the company states.



"OPTIMUS" RHEOSTAT

The design and construction throughout is according to power apparatus standards. Resistance coils are mounted on studs back of the panel board, providing better ventilation, increasing the overload capacity, and eliminating loosening of coils. Standard knife switches are used instead of battery type, with provision made for maximum number of resistance variations with minimum number of switches and settings.

The "Optimus" tank rheostat enables the electroplater to adjust the total resistance of a plating tank circuit so as to regulate the current density in the plating bath itself. This is accomplished by manipulation of the knife switches controlling the various resistances provided in the rheostat. Thus the plater is enabled to maintain a constant voltage drop from anode to cathode regardless of changes in the area of the cathode surface in the tank. As the voltage at the tank regulates the current density of plating, the average thickness of deposit in a given time is also definitely controlled, insuring uniform results.

The Type REI rheostat is equipped with voltmeter and ammeter mounted on the rheostat panel. The instruments and shunt are physically arranged so as to prevent distortion of meter readings. The voltmeter permits the plater to read, not only the line voltage, but also the voltage drop from anode to cathode directly at the tank. This latter reading is of prime importance in determining the conductivity of the solution. The ammeter provides visual proof of the total current passing through the solution, so that with a known cathode surface exposed, the current density can readily be calculated. With this calculation established, the amount of deposit in a given unit of time is easily and definitely determined.

The electrical ratings of these rheostats have been developed around the standard electrical ratings of single pole knife switches, and the resistance steps controlled by these knife switches are so designed that in normal service neither the resistance step itself nor the knife switch carries more than its correctly rated capacity, it is claimed. All Optimus tank rheostats are mounted on fireproof, non-fragile, asbestos panel boards.

New Touch-Up Spray Gun

The Alexander Milburn Company, Baltimore, Md., has developed a new touch-up gun for painting departments, sign shops, photographers, and for general use where a fine spray is required. The extremely fine mist, or spray, procured with this gun is desirable for decorating, shading, high-lighting and blending of

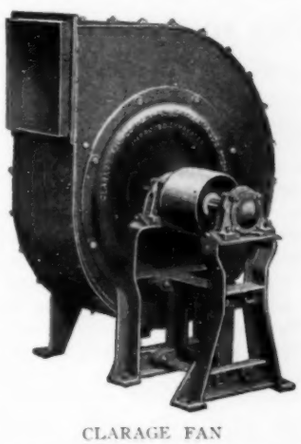
TOUCH-UP SPRAY GUN

colors on any surface, touching-up scratches, mars or dents in automobile bodies or machinery, decorating pottery, lighting fixtures, leather goods and novelties, blowing in backgrounds on photographs, show-cards and drawings, stenciling and numerous other fine painting operations, using lacquer, varnish or other paints.

In the "K-Jr." gun are embodied the same features and high-grade construction as in the Milburn Standard Type E. With the multiple-head, a flat horizontal or vertical spray or a round spray is obtained by a mere touch of the finger. The gun will operate on as small as ¼ h.p. air compressor. The complete "K-Jr." touch-up unit consists of the "K-Jr." gun, 6 extra 8-ounce cups with caps, 6 ft. air hose with connections, and wrench.

Exhauster for Universal Use

The new Clarage improved exhauster for industrial use is announced by the manufacturers, Clarage Fan Company, Kalamazoo, Mich. This apparatus is said to have a wide variety of applications, being designed to operate with any of six fan wheels, so that by changing wheels the exhauster can be changed from a trash handling device to a cotton fan, a standard speed exhauster, a slow speed fan, a mill exhauster, or an exhaust fan adapted to paint spraying work or other fume handling requirements. At the same time, it is claimed, this machine, on any given use, will operate at a slower speed than has heretofore been customary, thus causing less wear of bearings, shaft, fan, etc. It is adjustable to eight different air discharge directions and can be operated clockwise or counter clockwise as desired. SKF ball bearings are provided upon special order.



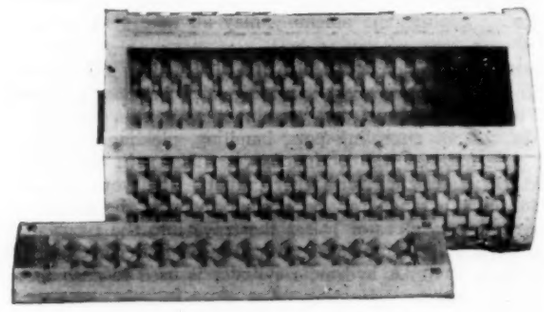
CLARAGE FAN

Wooden Plating Cylinders

The B. H. G. Specialty Company, Dayton, Ohio, are manufacturers of all wood electro-plating cylinders. By using straight grained wood woven over heavy hickory dowels, between hard wood heads, they make a solidly constructed cylinder. Only a small number of screws and bolts are used and these are all insulated.

Because of the rough, rolling inner surface small parts must tumble, and not stick fast or slide, it is stated. The nature of the weaving is such that ample circulation of the solution is obtained. The strength of this cylinder permits heavy loading when desired. The doors are full length and are wide enough to make loading and unloading easy. Positive cathode connections are made through a center rod.

All orders are built to the specifications of the customer. Any size and shape, with either brass or steel bolts and screws can be furnished. Also holes and bushings in the ends made according to the equipment in which the purchaser intends to use the cylinder.



WOODEN PLATING CYLINDER

Equipment and Supply Catalogs

Automatic Motor Starters. Allen-Bradley Company, Milwaukee, Wis.

Laclede Fire Brick. Laclede-Christy Clay Products Company, Milwaukee, Wis.

Spraying Equipment Booklet—E. Simons Paint Spray Brush Company, Dayton, Ohio.

Pressure and Temperature Metering. The Brown Instrument Company, Philadelphia, Pa.

Hipolime. E. Reed Burns and Sons, Inc., Brooklyn, N. Y. Covers a high polishing lime compound.

Recording Liquid Level Gauges. The Bristol Company, Waterbury, Conn. Also, Bristol's Counters.

Light Aluminum Casting Alloys. Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y.

The Job Specification. Metropolitan Life Insurance Company, New York. No 1 of a series of "Handy Manuals."

Hoisting Equipment. Henry B. Newhall Corporation, New Jersey Foundry and Machine Company Division, Garwood, N. J.

Engineering Foundation Annual Report for 1927-28. Engineering Foundation, 29 West Thirty-ninth Street, New York.

Best Motor Oils Are Vital. E. F. Houghton and Company, Philadelphia, Pa. A brochure on motor oils, by Charles E. Carpenter.

Trico Renewable Fuses. Trico Fuse Manufacturing Company, Milwaukee, Wis. Contains data on time lag and watt loss saving.

Prevention of Rust. W. Canning and Company, Ltd., Great Hampton Street, Birmingham, England. Covers "Ajax" cold electro-galvanizing salts.

"High-Duty" Magnetic Clutches. Magnetic Manufacturing Company, Milwaukee, Wis. Bulletin 72, covering application of magnetic clutches.

Monarch Equipment. American Saw Mill Machinery Company, Hackettstown N. J. Pamphlets on bench saws, motor head jointers, manual training lathes, etc.

Muntz Metal, Naval Brass and Manganese Bronze. Taunton-New Bedford Copper Company, Taunton, Mass. Covers plates, segments and circles made in accordance with U. S. Navy specifications.

A Set of Process Cards. The Egyptian Lacquer Manufacturing Company, New York. Forty-eight cards, each giving a process for metal finishing, including plating solutions dips, crystallizing solutions, oxidizing methods, directions for obtaining a wide variety of finishes on metals, etc. The company plans to send out each month a new card which can be attached to the initial group which has already been prepared. The set may be obtained from the company.

Evolution of the Testing Machine. Riehle Brothers Testing Machine Company, Philadelphia Pa. A detailed account of the invention and gradual increase in the use of the testing machine for determining the strength of iron, steel, metals and other substances subjected to strains. The facts are supplied by Frederick A. Riehle, president of the company, who was originally a scale manufacturer and, in 1866, designed and built a machine which was used to test the strength of iron.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

Society for Testing Materials

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

The thirty-first annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29th. Monday, June 25th, will be reserved for committee meetings and registration, the general opening session, to be held on Tuesday at 2 P. M. In addition, one session will be devoted exclusively to the Edgar Marburg lecture and the award of the Charles B. Dudley medal. The Edgar Marburg lecture will be delivered by **Dr. Frank B. Jewett**, president of the Bell Telephone Laboratories and the Charles B. Dudley medalist is **A. V. de Forest**, research engineer of The American Chain Company.

A tentative schedule of the meetings on non-ferrous metals is as follows.

Tuesday, June 26th, 8 P. M. Testing, Wear Testing of Metals.

Thursday, June 28th, 9:30 A. M. Metals: Corrosion, Fatigue and Properties at Elevated Temperatures.

Thursday, June 28th, 8 P. M. Non-Ferrous Metals and Metallography.

Among the papers which will be read are the following:

Calibration of Rockwell Hardness Testing Machines. F. S. Mapes.

The Calibration of Extensometers. R. L. Templin.

Measurement of Brittleness. P. L. Irwin.

Wear and Other Properties of Some Railroad Bearing Bronzes at Different Temperatures. H. J. French.

Report of Sectional Committee: On Zinc Coating of Iron and Steel. J. A. Capp, Chairman.

Some Factors Involved in Corrosion and Corrosion-Fatigue of Metals. D. J. McAdam, Jr.

Influence of Inhibitors and Accelerators on Corrosion-Fatigue of Metals. F. N. Speller, I. B. McCorkle and P. F. Mumma.

Testing of Materials at Elevated Temperatures. P. G. McVetty.

The Seizing of Metals at High Temperatures. N. L. Mochel.

Report of Joint Research Committee of A. S. M. E. and

A. S. T. M.: On Effect of Temperature on the Properties of Metals. G. W. Saathoff, Chairman.

Report of Committee B-1: On Copper Wire. J. A. Capp, Chairman.

Report of Committee B-2: On Non-Ferrous Metals and Alloys. William Campbell, Chairman.

Some Mechanical Properties of Nickel, Manganese-Nickel and Copper-Nickel Alloys. W. A. Mudge and L. W. Luff.

Tension Tests of Copper with Varying Dimensions of Test Specimen. C. H. Marshall.

Report of Committee B-4: On Metallic Materials for Electrical Heating. Dean Harvey, Chairman.

Report of Committee B-3: On Corrosion of Non-Ferrous Metals and Alloys. T. S. Fuller, Chairman.

Report of Committee D-14: On Screen Wire Cloth. R. W. Woodward, Chairman.

Report of Committee E-4: On Metallography. H. C. Boynton, Chairman.

NOMINATIONS FOR OFFICERS

The following nominations for officers are announced:

For president: G. W. Thompson, chief chemist, National Lead Company, Brooklyn, N. Y.

For vice-president: K. G. Mackenzie, consulting chemist, The Texas Company, New York.

For members of executive committee:

T. R. Lawson, head, department of civil engineering, Rensselaer Polytechnic Institute, Troy, N. Y.

H. S. Mattimore, engineer of materials, Pennsylvania State Highway Department, Harrisburg, Pa.

P. D. Merica, director of research, International Nickel Company, New York City.

Samuel Tobias Wagner, consulting engineer, Reading Company, Philadelphia, Pa.

American Electroplaters' Society

Baltimore-Washington Branch

HEADQUARTERS, CARE OF FRANK COLLINS, FERNDALE, MD.

NEW BRANCH IS ORGANIZED

A meeting was held Saturday, May 26, 1928, in the Southern Hotel, Baltimore, Md., for the purpose of organizing a branch of the American Electroplaters' Society. The arrangements for this meeting were made by William W. Chase. The meeting was addressed by H. Smith, supreme vice-president, who stated the object of the meeting and then asked for the election of a chairman. F. F. Pierdon was elected chairman. He called for the election of a secretary. This office was accepted by F. Collins.

George Gehling, supreme secretary-treasurer, explained the aims of the Society and the usual procedure in organizing a branch. Dr. William Blum spoke of the research work of the Bureau of Standards and of its benefit to members of the Society. He offered the use of a room at the Bureau for such meetings as are held in Washington.

George B. Hogaboom talked of the development of technical education among members and explained the methods of acquiring such knowledge and the opportunities open to members.

George Gehling discussed the difference between active and associate members, and imparted other information and good advice. Messrs. Barrows and Farber, research chemists at the Bureau of Standards, rendered a few remarks, stating that future meetings would be educational.

Thomas Slattery, superintendent of plating at the Bureau of Printing and Engraving, showed how the society had been of benefit to himself and others in qualifying for positions of greater responsibilities. H. H. Reama gave a few encouraging words, followed by Mr. Stevens, who pointed out the duties of members in regard to mutual help and good fellowship. A standing vote of thanks was then given William W. Chase for his preparation of the meeting and other efforts.

It was unanimously decided to apply for a charter, the branch to be known as the Baltimore and Washington Branch of the American Electroplaters' Society. The next meeting will be held at the Southern Hotel, Baltimore, Saturday evening, June 9th, at 8 p. m. Standard time.

Hartford-Connecticut Valley Branch

HEADQUARTERS, CARE OF V. E. GRANT, 43 PUTNAM STREET, BRISTOL, CONN.

FIRST BANQUET AND SESSION

The first educational session, banquet and entertainment of the Hartford-Connectcut Valley Branch of the American Electroplaters' Society was held at the Bond Hotel, Hartford, on May 12.

The educational session began at 2 p. m., with the following program:

Effect of Temperature on Silver Solutions, by Frank C. Mesle, research department, Oneida Community, Ltd.

Lacquers, by E. M. Hayden, general manager, Stanley Chemical Company.

What Happens at the Anode and at the Cathode, by Dr. A. K. Graham, chemical engineer, Hanson-Van Winkle-Munning Company.

Black Baking and Colored Enamels, by Amos Bissell, president, Bissell Varnish Company.

Chromium Experiments, by Oliver J. Sizelove, vocational school instructor, Newark, N. J.

During the period taken up by the session, the ladies were taken on a tour of the city. The banquet in the evening was highly successful.

New York Branch

HEADQUARTERS, CARE OF R. J. LIGUORI, 127 VANDERBILT AVENUE, BROOKLYN, N. Y.

There were meetings of the New York Branch on April 3 and April 27, both being well attended, although the officers and the members who attended regularly still feel that there are many delinquents who ought to appear at meetings more frequently.

At the April 3 meeting, Joseph Triska presented a paper entitled **Black Dip on Brass.** Discussion covered the following subjects:—Cause of Nickel Flaking; Effect of an Excess of Free Cyanide in a Silver Solution.

The Branch has been requested to send papers and displays to the Convention at Toronto. It is hoped that the members of this Branch will respond and keep the New Yorkers on the A. E. S. map.

THOMAS A. GARDNER.

Newark Branch

HEADQUARTERS, CARE OF R. F. CLARK, BOX 201, NEWARK, N. J.

NEW OFFICERS ELECTED

There was a business meeting of the Newark Branch on May 18, at Franklin Hall, with 19 members present and President Charles Bohler presiding. The important event was the election of officers for 1928-29, which resulted as follows:

President, George J. Wagner; vice-president, William De Voti; secretary-treasurer, Royal F. Clark; librarian, Samuel R. Taylor; sergeant-at-arms, William F. Harrison; **trustees,** Charles H. Bohler, Lewis H. O'Donnell, Alfred Vaughan. The following are the Newark Branch's delegates to the convention at Toronto:—Horace H. Smith, Oliver J. Sizelove, Philip Sievering; alternates: Royal F. Clark, Alfred Vaughan, A. Calabrese.

William E. Welsh was elected to active membership in the Branch. The members were given the regretful news of the death on May 12 of George C. Bartow, one of the most active members of the Branch.

The speaker of the evening was Samuel Taylor, who described the equipment of the plating and finishing department of a very large plant at Provdence, R. I. Discussion ment of a very large plant at Providence, R. I. Discussion the ball burnishing of brass buckles.

There was a meeting of the Branch on June 1, at which Samuel Taylor and others spoke. A complete report cannot be included as this issue was going to press at the time.

ROYAL F. CLARK, Secretary.

Worcester Branch

HEADQUARTERS, CARE OF ROGER H. BRYANT, 94 GROVE STREET, WORCESTER, MASS.

A branch of the American Electroplaters' Society will be organized at Worcester, Mass. At a meeting of a group of platers of that city, A. A. Brunnell was named temporary president, and Roger H. Bryant secretary. The group plans to apply to the Society for a charter and to establish itself formally as the Worcester Branch of the American Electroplaters' Society.

R. J. O'Connor, of Bridgeport, Conn., chairman of research of the American Electroplaters' Society, presided at the meeting held on May 14. The speakers of the evening were George B. Hogaboom, of Matawan, N. J., and Frank J. Clark, vice-president of the International Fellowship Club.

Another meeting will be held soon, at which plans will be completed for the organization of the branch. The committee in charge of plans consists of R. H. Bryant, of the North Works, American Steel and Wire Company; A. A. Brunell, of the A. A. Brunell Electroplating Company; and G. A. Jones, of the Reed & Prince Company.

American Welding Society

HEADQUARTERS, 29 WEST 39th STREET, NEW YORK CITY

The following new officers were elected at the annual meeting of the American Welding Society on April 26:

President, F. T. Llewellyn; senior vice-president, A. E. Gaynor; divisional vice-presidents: midwest, Ernest Lunn; mideast, J. W. Meadowcroft; New York and New England, H. P. Peabody; treasurer, C. A. McCune; secretary, M. M. Kelley. Directors at large: A. M. Candy, J. T. Deppeler, E. H. Ewertz, S. W. Miller.

The annual report of the president stated that there were 913 members in good standing on March 31, a gain of 239 during the year and a net gain of 59.

Lighting Equipment Association

HEADQUARTERS, 420 LEXINGTON AVENUE, NEW YORK CITY

The National Lighting Equipment Exhibition and the annual convention of the Artistic Lighting Equipment Association will be held at the Hotel Sherman, Chicago, Ill., the week of June 11, with sessions each day up to and including June 16. The exhibition will open at 12:30 on the first day, with Mayor Thompson of Chicago and a number of other speakers present. Thereafter the exhibition will be open each day from 1:30 to 9:00 p. m. There will be numerous group meetings, luncheons, dinners, etc., among which the following will be of interest to metal men:

Tuesday, June 12: Stamping and Parts Manufacturers, 10:00 a. m.; Exterior Lighting and Lantern Group, 3:30 p. m.; Floor and Table Lamp Group, 5:00 p. m.

Wednesday, June 13: General session, 9:30 a. m., during which the exhibit will be closed; Banquet, 7:30 p. m.

Thursday, June 14: Meeting of manufacturers selling through jobbers, 10:00 a. m.; 1:00 p. m., luncheon of dealers.

British Institute of Metals

HEADQUARTERS, 36 VICTORIA STREET, WESTMINSTER, LONDON, ENGLAND

There will be a 4-day annual autumn meeting of the Institute at Liverpool, September 4 to 7, 1928, inclusive. This is the first time the Institute has gathered at Liverpool and the meeting is expected to be very well attended. There will be an opening lecture, Non-Ferrous Metals in the Shipping Industry, by F. G. Martin, on September 4. The following two days will be divided between reading of papers and discussions which will be done in the mornings, and visiting of Liverpool district plants in the afternoons. On September 7 there will be an all-day motor trip to Wales.

The Institute of Metals of Great Britain held a general meeting on Tuesday, May 8, at The Institution of Mechanical Engineers, in London. At this meeting Prof. Cecil H. Desch presented the eighteenth annual May lecture; his subject was **The Chemical Properties of Crystals.**

Personals

Benjamin Popper

There are few men, if any, planning to attend the annual convention of the American Electroplaters' Society, in Toronto this year, who enjoy more popularity and reputation in the industry than Benjamin Popper of the Egyptian Lacquer Manufacturing Company, New York.

BENJAMIN POPPER

Ben, as he is called by hundreds of friends and business acquaintances, first saw the light of day in New York City some years after his company sold its first gallon of lacquer. The start the company had on Ben didn't worry him much, however and at an early age he determined to overcome this handicap, going with the Egyptian Lacquer Manufacturing Company in his early 'teens This was twenty-seven years ago. With this company Mr. Popper advanced rapidly and it was not long before he was promoted to an important position on the sales force, which position he has held for many years.

During this time he has called on most of the lacquer users in New York City and vicinity and through constant contact with these users and by intensive study and hard work, Mr. Popper has come to be considered an authority on lacquers and their application.

He was one of the first associate members of the New York Branch of the American Electroplaters' Society, in which he has always taken an active part. There are few banquets, outings or meetings held in which Ben Popper is not right in the centre of activities and it is almost a rule that a national convention cannot be held without him. Mr. Popper is also a member of the International Fellowship Club, the Elks Club and the Grand Street Boys' Association.

Twenty-seven years is a long record, and it is quite natural that during this time as a lacquer salesman Mr. Popper has seen many changes; changes not only in materials, methods and systems, but in personnel as well. Old friends have passed on and new ones have replaced them. But the friends Ben Popper made some twenty-odd years ago, who are still in the industry, have remained his friend. During these years he has been the Aladdin-like growth of the lacquer industry from an output in his early days of thousands of gallons per year, to the millions of gallons per year produced and used now.

Stephen S. Tuthill, the secretary of the American Zinc Institute, Incorporated, has been elected president of the Trade Association Executives in New York City.

William H. Finkeldey and **John P. Hubbell** have joined the firm of Singmaster and Breyer, metallurgists and chemical engineers of 420 Lexington Avenue, New York.

Dr. Robert J. Anderson, director of research for the Fairmont Manufacturing Company, Fairmont, West Va., manufacturers of aluminum sheet and coil, has been elected a vice-president.

Harry Abrams has been appointed purchasing agent for E. R. Caldwell and Son Brass Company, Syracuse, N. Y., to succeed **Ray Caldwell,** who has terminated his connection with the company.

Dr. **Robert J. Anderson,** director of research for the Fairmont Manufacturing Company, Fairmont, W. Va., manufacturers of aluminum sheet and coil, was elected a vice-president of the company at the last meeting of its board of directors.

J. **C. Ten Eyck, Jr.,** previously a sales engineer for the Combustion Engineering Corporation, for whom he was at one time Detroit district manager, has been appointed sales manager for the Standard Steel Propeller Company, Pittsburgh, Pa., manufacturers of aeronautical propellers. Mr. Ten Eyck is a marine engineer.

J. **V. Moore,** formerly with the Simonds Saw and Steel Company, is now representing The Billings and Spencer Company, Hartford, Conn., in their line of wrenches, hammers, pliers, clamps, dogs, etc., in Pennsylvania, Delaware and New Jersey with headquarters at The Leister House, Huntingdon, Pennsylvania.

J. **H. Phinney** has been appointed exclusive sales representative for the eastern part of Michigan by the Magnetic Manufacturing Company, Milwaukee, Wis., manufacturers of magnetic separation equipment, magnetic clutches for power transmission, etc. Mr. Phinney's headquarters will be at 420 United States Mortgage Building, Detroit Mich.

Richard I. Neithercut, formerly secretary of the Bridgeport Brass Company, has become associated with Industrial Administration, Inc., 551 Fifth Avenue, New York, of which he is vice-president. Mr. Neithercut will represent the company in New England. The company specializes in administrative control of manufacturing enterprises.

John P. Hubbell, until May 1 assistant chief of research of the New Jersey Zinc Company, has become a partner in the firm of Singmaster and Breyer, chemical engineers and metallurgists, 420 Lexington Avenue, New York City. Mr. Hubbell is a graduate of Williams College and Columbia University. Prior to his nine-year connection with the New Jersey Zinc Company, he was with the General Chemical Company and in the Gas Defence Division of the United States Army.

W. **M. Corse,** consulting metallurgist, Washington, D. C., and secretary of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, attended the meetings of the Institute of Metals of Great Britain in London during the week of May 8. Mr. Corse visited France, England, Sweden and Norway, and addressed the Society of Scientific and Industrial Research at Stockholm, Sweden, on the subject of **Industrial Research in the United States.**

William H. Yawger, for many years a vice-president and treasurer of the Weston Electrical Instrument Corporation of Newark, N. J., has resigned from active duty in order to conserve his health. **Mr. Yawger** became associated with the Weston company in 1892, just four years after it was organized. His period of active service was thirty-six years and he still remains on the board of directors with title of vice-president. Mr. Yawger was born in Lockport, N. Y., and was associated with the Cowles Electric Smelting and Aluminum Instrument Company.

Charles Starr Barbour, a well known electroplating expert has joined the technical division of the International Chemical Company, Philadelphia, Pa., for whom he will devote most of his efforts to the New England territory. Mr. Barbour is well known in plating circles. He started with the Barbour Silver Company, Meriden, Conn. Later he performed a great deal of consulting work in electroplating, particularly with the Bureau of Standards and the Bureau of Printing and Engraving. For the past few years he had been chief technical service man for the A. P. Munning Company.

W. Parker, director of sales, British Furnaces, Ltd., has been traveling throughout the United States during the past few weeks studying the new types of furnaces in use by various industries of America. British Furnaces, Ltd., is the representative of the Surface Combustion Company, Toledo, Ohio, throughout Great Britain. In England the fuel costs are relatively more important than labor costs. While the reverse is true in the United States, said Mr. Parker, use of automatic heat control equipment and automatic furnaces have been less fully developed over there than here. It appears that there is a decided trend to copy American practices and to give more prominence to automatic furnace operation.

John T. Stoney, having resigned as vice-president of the Ferro Machine and Foundry Company, Cleveland, Ohio, with which he had been connected since 1906, will devote all of his time to the Stoney Foundry Engineering and Equipment Company, Cleveland. Mr. Stoney founded the latter concern eight years ago and is its president. His son, **R. E. Stoney,** has also left the Ferro company to become associated with his father. The elder Stoney started as a foundry apprentice at the Robert Gray Brass Foundry, Cleveland, in 1877. Then he went to work in the brass foundry of the Cleveland Shipbuilding Company and later the U. S. Bronze Company. Following that he became successively superintendent of brass foundry for the Westinghouse Machine Company, East Pittsburgh, general foreman of the Ferro Machine and Foundry Company, foundry superintendent of this company, then factory manager and first vice-president, in which capacity he remained until his resignation.

Obituaries

George W. Niedringhaus

George W. Niedringhaus, chairman of the board of the National Enamelling and Stamping Company, Granite City, Ill., a prominent factor in the industrial development of the St. Louis district, died on April 19 at his St. Louis home. He was 64 years of age, the son of William F. Niedringhaus, one of the founders of the St. Louis Stamping Company, which later became the National company.

George W. Niedringhaus was active in that company's development, as well as in the founding of several steel and coke plants. His ramified business connections included banking, railroad, public utility and other interests.

Arthur Dwight Dana

Arthur Dwight Dana, retired manufacturer, formerly president of the Chicago Fuse Manufacturing Company, died in New York City on May 25. He was 67 years of age and had been ill for a long time.

Mr. Dana started his career in business with the Linkbelt Machinery Company, Chicago, of which he became treasurer. Later, in 1896, he founded the Fuse concern, which became one of the largest of its kind in the world. Mr. Dana was also active in the formation of the Sperry Electrical Company and later was a director of the Sperry Gyroscope Company, Brooklyn, N. Y. Before retiring from business some years ago, he was a director of the Goodman Manufacturing Company, Chicago, and at one time he owned the Moore Drop Forging Company, Springfield, Mass.

Edgar Fahs Smith

Edgar Fahs Smith, Provost of the University of Pennsylvania, formerly head of the Chemistry Department of that University, and widely known as "the dean of American chemists," died of pneumonia on May 3, in the seventy-second year of an extremely active life as a scientist and author.

Dr. Smith received honors from a great many universities throughout the world; a list of the awards and degrees he received, among which are the Priestly Medal of the American Chemical Society and the Legion of Honor of France, would require a great deal of space which is unavailable.

Dr. Smith performed research in chemistry, electro-chemistry, metallurgy of Molybdenum and tungston, and the determination of atomic weights.

Michael Blake

Michael Blake, president of the Federal Iron and Metal Company, Newark, N. J., died on May 1, at Tucson, Ariz., where he had gone at the advice of his physicians. He was fifty-nine years of age and is survived by his widow and two daughters

News of the Industry

Industrial and Financial Events

Veeder and Root Firms Unite

The Veeder Manufacturing Company of Hartford, Conn., for many years manufacturers of small, high grade counting machines and fine die castings, and The Root Company of Bristol, Conn., well known manufacturers of heavy duty counters, hinges and stampings, have united in a merger to be known as Veeder-Root Incorporated.

These two companies have for many years been competitive in the counter field but the development of each has been along slightly different lines.

John T. Chidsey, formerly president of The Root Company, has been made president and general manager of the new company. Graham H. Anthony, formerly vice president of The Allen Manufacturing Company of Hartford is to be vice president in charge of production. Ralph C. Coxhead, formerly of the Ralph C. Coxhead Corporation, New York, will be vice president in charge of sales.

"Eveready" to Sell Radio Sets

The National Carbon Company, Inc., has decided to enter the radio receiving set field, according to an announcement which was issued from the Company's offices in New York on May 22. The announcement put an end to the speculation which had been rife in the radio field for the last several months concerning the entrance of this organization into the receiving set business. The company is probably the largest producer of radio batteries in the United States. It makes the well known "Eveready" batteries. It will sell both A. C. (batteryless) sets and battery-operated sets, beginning with the Fall radio buying season. Models will be on display at the Chicago Trade Exposition in June.

Westinghouse Electric Profits

The annual report of the Westinghouse Electric and Manufacturing Company for the fiscal year ended March 31, 1928, shows gross earnings of $175,456,815, as compared with $185,543,087 for the previous year and $166,006,800 two years ago, and net manufacturing profit of $14,109,459, against $15,779,001 and $14,294,861, respectively, in the two preceding years.

Zinc Producers to Control Production

At the international conference of zinc producers recently held in Brussels, a resolution was unanimously adopted in favor of controlling the market by the creation of a bureau of statistics and by the restriction of production, should the necessity arise. Overseas producers are to be invited to cooperate in the European convention.—A. C. B.

Winchester Repeating Arms Company

Total sales reported by the Winchester Repeating Arms Company, New Haven, Conn., for the year 1927 amounted to $15,537,959. Net earnings were reported as $428,036, as compared with $744,239 last year, and a loss in 1925 of $366,215.

International Nickel Company

Net profit of $2,107,920 was reported by International Nickel Company for the quarter ended March 31, 1928, after depreciation, depletion and Federal taxes. This compares with $1,881,225 in the preceding quarter, and $1,407,707 in the first quarter of 1927.

General Cable Corporation

General Cable Corporation reports for quarter ended March 31, 1928, net income of $370,845 after all charges.

Copper Wire Concerns Merge

The National Electric Products Corporation has been formed by the merger of the American Copper Products Corporation, Bayway, N. J., the National Metal Molding Company, Pittsburgh, Pa., and the British American Metals Company, Plainfield, N. J. The new concern, which will be one of the largest copper-consuming organizations in the world, is to be headed by Wylie Brown, president. The merged companies are non-competitive manufacturers of electrical transmission apparatus of practically every description. A majority interest in the stock of the Habirshaw Cable and Wire Company, with mills at Yonkers, N. Y., and Bridgeport, Conn., is held by the new company.

The financial arrangement involved the creation of new stock, both common and preferred, which will be exchanged for the various securities of the merger companies. The board of directors includes W. C. Robinson, chairman; O. F. Felix, C. F. Holdship, H. C. Carpenter, and C. J. Gleason. Headquarters will be in New York City.

Locker Concerns in Merger

The Lyons Metallic Manufacturing Company of Aurora, Ill., and the Durand Steel Locker Company of Chicago Heights, Ill., have been consolidated. The companies manufacture steel cabinets, tables and other steel products. The new company will be known as Lyons Metal Products, Inc., and will continue to operate existing plants.

F. S. Waters, former president and founder of the Lyons Metallic Manufacturing Company, will head the new organization. Keith Spalding, president and founder of the Durand Steel Locker Company, will be vice-president. The corporation plans development of new products.

Brass Pipe Sales Gain Steadily

Sales of brass pipe have nearly quadrupled in the past six years, according to figures issued by the Copper and Brass Research Association. In 1922 the sales of standard I. P. S. brass pipe were 16,016,500 pounds; last year they were 62,934,300 pounds, a gain of nearly 300 per cent. It is expected that 1928 will show a gain of at least 18,000,000 pounds over 1927. The average annual gain in the four years from 1923 to 1927 has been 74.5 per cent; the largest gain was made in 1926, when sales were 234 per cent above 1923.

Yale and Towne Reports Profits

Yale and Towne Manufacturing Company reports for the quarter ended March 31, 1928, net profits, after depreciation and taxes, of $373,089 against $532,875 in same quarter in 1927.

The company recently acquired the Damm and Ladwig Company of Velberg, Germany, the largest European manufacturer of locks and builders' hardware. Results of this division are not included in the above earnings report, however, as figures are not yet available.

Production of Aluminum in 1927

The value of new aluminum produced in the United States during 1927 was $39,266,000, an increase of 4 per cent as compared with 1926, according to a statement prepared by J. M. Hill, of the United States Bureau of Mines, Department of Commerce.

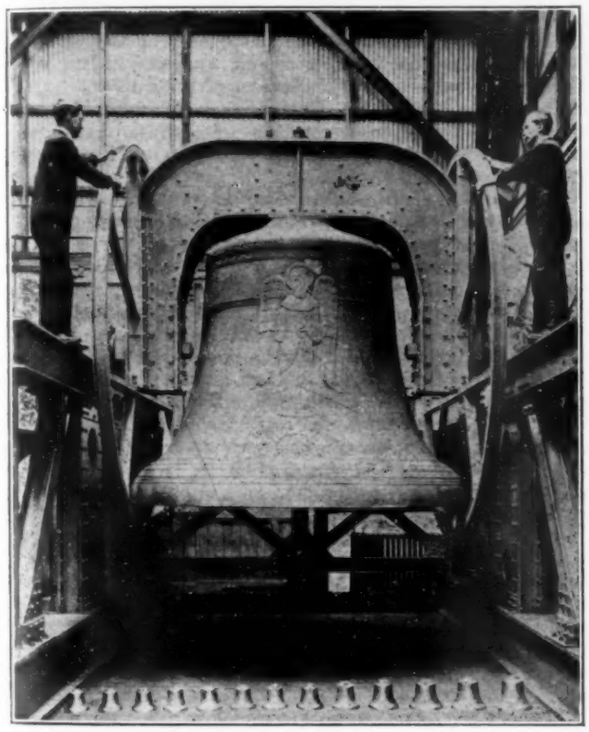
The domestic price of new aluminum ingot 99 per cent pure, as quoted by the Engineering and Mining Journal, was 27 cents a pound during the first half of January, 1927. On the 15th of January the Aluminum Company of America lowered its price to 26 cents, which held until October 20, 1927, when a further cut to 25 cents a pound was announced, which price remained in force

to the end of the year; the average quoted price for the year was $0.2584 a pound. Prices of outside metal 98-99 per cent pure were from two-tenths to seven-tenths cents less a pound than the figures given by the Aluminum Company of America, and it seems probable that a fair average price for all new aluminum sold in 1927 was $0.254 a pound, the report states.

In spite of curtailed production of automobiles the use of aluminum and high strength aluminum alloys was large, particularly for pistons and reciprocating parts of automotive engines.

Huge Carillon for New Church

When the new edifice of the Park Avenue Baptist Church, New York, is completed, the foundry industry will be well represented in its construction by the addition of seven new bells to its carillon. These will weigh a total of about 113 tons. The carillon, to be known as the Rockefeller Memorial, will have one bell, the



BOURDON FOR ROCKEFELLER MEMORIAL CARILLON

"bourdon," largest of the seven, that will alone weigh 44,800 pounds and will be the largest carillon bell in the world. With its steel frame it will weigh 78,400 pounds. The bell has been cast in the foundry of Gillet & Johnston, Croydon, England. It will sound low C and will be four semi-tones lower than the largest carillon bell now in use. Also, the addition of these seven bells will make the church's carillon the largest in the world, achieving for the first time in history a range of five octaves in a carillon. Further additions are planned for future years which will give the carillon 72 bells, or six octaves; this is nearly the range of a piano, which has seven and one-third octaves.

Exhibition of Art in Industry

The International Exhibition of Art in Industry, second of its kind to be held in this country, opened at Macy's, New York City on May 14 and continued until May 26; it attracted thousands. Six countries, including the United States, displayed a total of more than 5,000 objects, chiefly of furniture and interior decoration. Not the least interesting feature was the arrangement of the hall itself, which was designed by Lee Simonson, noted costume and scene designer. The walls were beautifully prepared, a great deal of metal being used, especially strips of copper, brass and nickel-plated metal.

In the exhibition there were rooms devoted to separate countries, each nation having one or more rooms in which its exhibits were displayed. There was a great deal of metal ware, especially brass, pewter, copper and silver. While some of these were not the products of regular commercial industry but rather of sculptors, etchers or other artists, the greater part of the metal ware displayed had been commercially produced in foundries, metal working shops, or other industrial works. These were real evidences of the steady trend of industry toward true artistic creation. Among the American exhibitors were the following:

General Electric Company, The Crane Company, Sterling Bronze Company, Albert Voight Manufacturing Company, International Silver Company, McLeod, Ward and Company, and Reed and Barton.

Russian Gold Shipments

Shipments of Russian gold to a total value of $350,000,000 were received by the United States during the years 1920-1922, according to the report of the United States Senate Commission of Gold and Silver Inquiry, quoted in a pamphlet "Russian Gold," released May 20 by the Amtorg Trading Corporation of New York. The conclusions in the Senate Report of 1925 are corroborated by customs statistics of Sweden, France and Switzerland, the countries through which Russian gold found its way here, and dispatches in the press of 1920-22 regarding Russian gold shipments. The brochure of 72 pages also contains data regarding Russian gold production, the present Soviet gold reserve and Soviet foreign trade.

Production of Zinc in 1927

The production of slab zinc at zinc reduction plants in the United States in 1927 amounted to 635,300 short tons, valued at $81,439,000, according to statistics compiled by the United States Bureau of Mines, Department of Commerce. This production consisted of 576,960 tons of primary metal made from domestic ore; 15,556 tons of primary metal made from Mexican ore; and 42,784 tons of redistilled secondary metal. The production in 1927 was 23,921 tons smaller than the production in 1926, or nearly 4 per cent.

Rolled zinc produced in the United States in 1927 amounted to 148,259,718 pounds, valued at $13,671,530. These figures, which were compiled from reports made by producers to the Bureau of Mines, show a drop of 14 per cent in quantity and 24 per cent in value of output, as compared with 1926. "Boiler plate and sheets over one-tenth inch thick" was the only class of rolled zinc to show an increase in production in 1927. Total exports of rolled zinc decreased 15 per cent.

The average selling value of rolled zinc was 9.2 cents a pound in 1927, compared with an average selling value of 10.4 cents in 1926.

Arc Welding Prizes Awarded

Seventeen thousand five hundred dollars, donated by The Lincoln Electric Company, Cleveland, Ohio, was distributed at the opening session of the spring meeting of the American Society of Mechanical Engineers, held at the William Penn Hotel, Pittsburgh, Penna., on May 14. The occasion was the awarding of prizes to the winners of the Lincoln Arc Welding contest which closed Dec. 31, 1927.

James W. Owens, director of welding for the Newport News Shipbuilding and Drydock Company at Newport News, Va., won the first prize of $10,000. Owens is a past vice-president of the American Welding Society and a fellow of the American Institute of Electrical Engineers. He is also author of the text book "Fundamentals of Welding." Five thousand dollars, the award for the second best paper submitted, was won by Henri Dustin, Professor in the Engineering School of the University of Brussels, Belgium, and Director of the Laboratory for Material Testing. Third place award, $2,500 was given to Commander H. E. Rossell, Construction Corps, United States Navy, instructor of mathematics at the U. S. Naval Academy at Annapolis. Honorable mention was given to the papers submitted by Frank B. Walker, Winthrop, Mass., and B. K. Smith, president of the Big Three Welding and Equipment Company, Houston, Texas.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

June 1, 1928.

The ivory button department of the **Waterbury Button Company,** started by the concern when it first began business in 1878, has been consolidated with the **Button Machinery Company,** Hoboken, N. J. The deal was consummated through an exchange of stock so that a substantial interest remains in local hands, although the machinery and manufacture of the buttons has been moved to Hoboken. Officers of the local concern say it plans to expand further in the metal working lines. Waterbury is essentially a metal city, although at the start there was a large business here in buttons of ivory and other composition, because of the specializing in metal the best facilities for making ivory goods do not now exist here. The change will not affect employment adversely, according to **Warren F. Kaynor,** secretary and general manager of the local concern. With the exception of a few ivory turners, all hands will be retained here through the expansion of the toy trade by the local concern. The company is now making a toy airplane which actually flies and has orders for several thousand gross, in addition to its regular orders for metal buttons, radio accessories and pocket lighters. Such expansion is expected this year that additional help will be needed shortly, Mr. Kaynor said.

The American Brass Company last month advanced the price on all copper products ¼ cent a pound.

The American Pin Company division of the **Scovill Manufacturing Company** reports that its customers are buying more conservatively and that business is not as good as it was the first three months of the year.

The request of the **American Brass Company** for permission from the city to fill in the old Manhan canal will depend upon the city's securing from the company the necessary right of way for the trunk sewer beside the Naugatuck river on land owned by the company, it is learned. It is understood that when the canal is filled in that new factory buildings will be built there.

John A. Coe, president of the **American Brass Company,** was re-elected president of the Y. M. C. A. at the annual meeting last month. **Burdon P. Hyde,** assistant secretary of the **Scovill Manufacturing Company,** was re-elected vice president.

Officials of the **Chase Companies., Inc.,** and members of the **Foremen's Association,** entertained officials of the **Remington Arms Company** of Bridgeport and its foremen's club at the Chase clubrooms last week.

John A. Coe, president of the **American Brass Company** was the guest of honor and principal speaker at the annual guest night of the local Industrial Foremen's Club last month. Officers of the Meriden Industrial Foremen's club were also guests. **George O'Donnell** of the **American Brass Company,** president of the club, and **William Mordo,** of the **International Silver Company,** vice president of the club, were in charge of the entertainment.

Among local patents granted during the last month were: an electric conductor to **James R. Coe,** assignor to the **American Brass Company;** a metal drawing apparatus to **Delmar Kinnear,** assignor to the **American Brass Company;** a chart drive roll for strip recording apparatus to **Herman Koester,** assignor to the **Bristol Company;** and a pocket lighter to **William Raeburn.**

The United States Employment Service reports for Waterbury: "An improvement in the industrial employment situation was noted in May. There is a slight shortage of highly skilled operators in the metal working plants." **Secretary Frank Green** of the local Chamber of Commerce reports that the employment figures for eight of the largest factories totaled 18,164, an increase of 495 or 2 percent over the same period last year. The number employed in 43 concerns, including those employing 100 or more, totals 31,612.—W. R. B.

Bridgeport, Conn.

June 1, 1928.

The Baird Machine Company is erecting an addition, 100 by 150 feet, one story high of brick construction with steel trusses and steel sashes. The estimated cost is $80,000.

Most of the machinery has been moved from the Hancock avenue plant of the **American Tube and Stamping Company** and in the future operations will be confined to the Howard Avenue plant and the Stratford avenue plant. The rolling work has been transferred to Howard avenue and the press work to New Britain. Two large new furnaces have been installed at the Stratford avenue works. Whether the Hancock avenue plant will be sold has not been disclosed.

Remington Arms Company has leased a two-story brick factory building on Seaview avenue to **Ramses, Inc.,** of New York. The building has 25,000 feet of floor space.

The Bullard Machine Company is planning to build a foundry on Brewster street, 100 by 200, two stories high of reinforced concrete and steel construction with a corrugated asbestos roof.

As a result of the death some months ago of **David N. Armstrong,** the **Armstrong Manufacturing Company** is being reorganized. **Frederick S. Ashmun, son** of the daughter of **Frank Armstrong,** who founded the company, becomes active head of the industry as secretary and treasurer. His father, **B. I. Ashmun,** is to be elected president, and his brother, **Harry Ashmun,** of New York, will be vice-president. The directors will consist of these three and **Charles Neubauer,** works manager, and **T. E. Steiber,** attorney. Mrs. Laura Lee Armstrong, and Mrs. Mary Clifford Armstrong, wives of sons of the founder of the concern, and Charles H. Armstrong, a grandson, are disposing of their stock to the Ashmun interests and resigning as officers and directors. The company manufactures stocks, dies, tools for water, gas, steamfitting and electrical works.

Among local patents granted during the month are: automobile bumper bracket to **Oscar Goetz,** assigned to the **American Chain Company;** three different couplings for bead chains to **W. J. Gagnon,** assigned to the **Bead Chain Manufacturing Company;** attachment plug to **Howard Sargent,** assigned to the **General Electric Company.**

Daniel Keating, chief engineer and superintendent of the mechanical department of the **American Tube and Stamping Company** plant, employed by the concern for 40 years, was the guest of honor at a reception in the Hancock plant May 11. He started work as a machinist and has several patents to his credit.

Officials of the **General Electric Company** were hosts to 600 representatives of many of the largest electrical manufacturing concerns in the country at the plant here the latter part of April. A conference, dinner, inspection of the plant and entertainment were held.

Henry A. House, 88 years old, the city's foremost inventor, was honored at a reception last month. It was attended by many of the most prominent people of the city. He was an associate of **Samuel F. B. Morse** in the invention of the original printing telegraph machine and has collaborated with Hudson, Sir Hiram, and Percy Maxim, and with **Thomas Edison** and **Frank Morris.** He figured in the Maxim-Edison suits over the incandescent lights, fought out in the local courts, and that against **William Graham Bell** in which it was proved that Mr. House was the first man to conceive the art of transmitting articulate speech with intensive electric current as opposed to the Bell method of using a pulsating current. In 1866 he devised and built a steam automobile which he operated through the streets of the city. He is credited by Hudson Maxim with being the first man to make a heavier than air flying machine to rise from the ground, built by him and Mr. Maxim in England in 1889 for the British government. It lifted a weight of 10,000 lbs. but was dashed to pieces against the trees.—W. R. B.

Connecticut Notes

June 1 1928.

HARTFORD—The 29th annual meeting of the **Connecticut Chamber of Commerce** was held here May 17. Among the general directors elected were **F. S. Chase**, president of the **Chase Companies, Inc.**, of Waterbury, and **Roy C. Wilcox**, assistant secretary of the **International Silver Company**, of Meriden. **A. R. Kimball**, president of the Chamber, reported on the activities of the year, including the starting of the attempt to clean up the Naugatuck river.

C. E. **Whitney**, president of the **Whitney Manufacturing Company**, of this city, is one of the committee of 100 from all states of the Union which has formulated a platform for American industry to be presented to both major political parties.

Directors of the newly organized **Veeder-Root Inc.**, formed by a merger of the Veeder Manufacturing Company here and the **Root Company**, of Bristol, were elected last month as follows: Graham H. Anthony, Fuller F. Barnes, John T. Chidsey, V. Russell Leavitt, David J. Post, Charles D. Rice and Charles T. Treadway of Bristol, Frederick S. Chase of Waterbury, and Curtis H. Veeder and Frank E. Wolcott of this city. Officers of the company were elected as follows: President-treasurer, Mr. Chidsey; vice-president in charge of manufacturing, Graham H. Anthony; vice-president in charge of sales, Ralph C. Coxhead; secretary John H. Chaplin. Stock of the company was offered at $42.50 a share but speedily climbed to $46 and was heavily oversubscribed.

The **Billings and Spencer Company** is now producing numerous small drop forgings for the **Pratt and Whitney Company**, to be used in the latter's aircraft engines. It is also producing forgings for the **Cadillac** and other motor companies. This has made its business outlook the best in many years and is reflected in the higher price of its stock.

MERIDEN—**The International Silver Company** has acquired the hollow ware manufacturing business of **E. G. Webster and Sons, Inc.**, of Brooklyn, N. Y., and will move that business to Meriden.

Among speakers at the state convention of credit men held here May 17th were **J. H. Thompson** of the **Yale and Towne Manufacturing Company**, Stamford; **R. H. Ryan** of the **Pratt and Whitney Company**, Hartford; **W. H. Baer** of the **Waterbury Button Company**; **John P. Griffin** of the **Chase Companies, Inc.**, and **J. Louis Geist**, of **Plume and Atwood Manufacturing Company**, both of **Waterbury**; and **H. A. Leigh** of the **Seymour Manufacturing Company**, Seymour.

NEW BRITAIN—**The North and Judd Manufacturing Company** has retired the outstanding issue of $225,000 bonds of **Traut and Hine Manufacturing Company**, which it assumed when it purchased the latter company about two years ago.

The **Stanley Works** has transferred many of the manufacturing operations of the **American Tube and Stamping Company, of Bridgeport**, to its local plant.

BRISTOL—**The New Departure Manufacturing Company** has established a free clinic to provide vaccination for its employes. The city has had a smallpox scare. The company, through its clinic, has rendered immune practically all of its employes.

DANBURY—**Vasco Capellaro** as appointed trustee of the **Danbury Iron Works** at a meeting of the creditors of the company held before Referee in Bankruptcy John Keogh last month. The company failed, with assets of $18,000 and liabilities of $16,755. The greater majority of assets, however, are embodied in a list of outstanding accounts, many of which are not collectible. **T. William McAllister, Wallace Olmstead and John Doran** have been named appraisers.

TORRINGTON—**The Handey Machine Company** has let a contract for extensive interior alterations to its local plant.

MIDDLETOWN—Directors of the **Russell Manufacturing Company** have declared their second dividend following the suspension of dividends for over a year. Both dividends were of 1½% and although the company has not established this as regular, it is understood that it will be established. Business has been better and in the automobile accessories department overtime schedules are being maintained.

NEW HAVEN—**The Acme Wire Company** reports operations at about 60 percent of capacity and that although customers are buying conservatively, prospects for business are good and prices are fair.

The Western Electric Company is starting to erect a plant addition in West Haven at a cost of $100,000, to be used for manufacturing and storage.—W. R. B.

Providence, R. I.

June 1, 1928.

The advent of another month finds the smallest per centage of metal workers out of employment in this city and vicinity since the close of the pre-war period. Taken as a whole, the first five months of 1928 have been fairly busy ones and the present indications are that these conditions will continue. The two principal reasons for this improved condition are activity in building trades and increased operations in the jewelry industry and its co-ordinate lines. In this connection the report of the Providence industrial survey taken between May 10 and July 27 last year by the **Massachusetts Institute of Technology** is particularly interesting and instructive. Returns were received from 246 firms in the jewelry and silverware group having a total employment of 7,141 men and 4883 women who received salaries and wages to the amount of $10,106,986 and $4,024,694, respectively, making a total of 11,974 persons employed who received a total of $14,131,680. These concerns purchased materials to the value of $19,644,150, producing goods to a factory value of $45,362,229, of which goods $42,853,080 worth was distributed. Of this, $13,555,193 was by direct sales; $2,463,369 through brokers or agents; $17,793,399 through jobbers; and $9,041,119 through retailers.

More than one hundred apprentices in the shops of the **Brown and Sharpe Manufacturing Company** attended a dinner and entertainment early in the month at the Port Arthur restaurant. Among the speakers at the dinner were **Henry D. Sharpe**, president and treasurer of the corporation, and **Clayton R. Burt**, the latter a graduate of the Brown and Sharpe apprentice shops, who is now vice-president and general manager of a large manufacturing company in Hartford, Conn. **Ian K. Davey**, one of the apprentices, officiating as toastmaster.

Cannon and Brown, Inc., located at 183-185 Eddy street, have recently installed an up-to-date chromium plating plant licensed by the **Chromium Corporation of America** and are now prepared to handle all lines of goods in chromium plating. They also do all kinds of nickel and silver work.

The Benwen Company, a concern to manufacture and deal in jewelry in Providence, has been granted a charter, with an authorized capital stock of 600 shares of no par value. Incorporators are Thomas S. Bennett, Carl M. Wendelstein and Ralph R. Bradley, all of Providence.

Providence Electroplating and Polishing Company, at 226 Eddy street, Providence, is owned and conducted by **Harry L. Benson**, according to a statement of ownership filed at the city's clerk's office.

The Reiser Jewelry Company has been granted a charter to manufacture jewelry in this city, with an authorized capital stock of $50,000 consisting of 500 shares of common stock at $100 each. The incorporators are George Triedman, Eugene H. Reiser and Alfred Deneman, all of this city.

A charter has been granted the **National Metal Products Company**, East Providence, with an authorized capital of $25,000 consisting of 250 shares of preferred stock of $100 each and 200 shares of common, no par stock. The incorporators are George G. Bell and S. G. Bell, of 244 Pleasant street, East Providence, and George H. Bell of Smithfield, R. I.

The Eureka Ring Company of Providence has been granted articles of association to conduct a manufacturing jewelry business with a capital stock of $20,000 consisting of 200 shares of common stock of $100 each. The incorporators are Biagio Amicarelli, Lorenzo Agresto and Judah C. Semonoff, all of this city.

Plans have been prepared for a two-story brick addition to the plant of the **D. M. Watkins Company**, corner of Foster and Pine streets. It will cost about $20,000.

Under new management the **Pawtucket Electro-Plating Company** has been rearranging and improving its plant at 112 East avenue and is now making a specialty of nickel plating auto and stove parts.—W. H. M.

Middle Atlantic States

Trenton, N. J.

June 1, 1928.

The metal manufacturers in this city report that business conditions in New Jersey are showing signs of improvement and that an increase in orders is expected with the approach of summer.

Fred A. Barton, president of the **Trenton Emblem Company**, reports that his factory is working on large orders for metal cemetery markers.

William G. Wherry, president of the **Skillman Hardware Manufacturing Company**, has recovered from a long illness.

The Trenton Auto Radiator Works has been granted a patent on a brazed brass tube used in the manufacture of its Ford replacement radiator to eliminate the old malleable iron or brass connection used as an inlet to the upper tank.

Following concerns have been chartered at Trenton:

Allen Chemical Products, Inc., chemicals, 8,000 shares no par, Elizabeth; **American Screen Company**, screens, $125,000, Paterson; **Independence Photo Engraving**, $50,000, Runnemede, N. J.; **Passenger Airways Corporation of America**, manufacture airplanes, $1,000,000, Hoboken; **Perth Amboy Aeroplanes Corporation**, manufacture aeroplanes, $500,000 preferred, 15,000 shares common, Perth Amboy; **Matthew's Speedometer Hospital**, manufacture speedometers, $20,000, Paterson; **American Zeolite Corporation**, chemicals, 1,000 shares, Paterson; **New-Matix Equipment Company**, manufacture tools, 500 shares no par, Audubon; **Hartman Corporation**, tools, $25,000, Somerville; **Reliable Welding Corporation, Inc.**, Jersey City, $30,000; **Precision Metal Products Company**, Union City.—C. A. L.

Newark, N. J.

June 1, 1928.

Plants in this city announce better business conditions and say the prospects look brighter than in some time. All sorts of copper, brass and aluminum products are manufactured here, and Newark ranks first in metal production of all the cities in New Jersey.

The Big Four Spark Plug Company, recently incorporated with 200 shares on par value, will soon begin the manufacture of spark plugs in a local plant. Charles L. Von Drele, Rudolph Schroeder and Eleanor Riordan, all of Hoboken, are officers of the new concern.

The Protective Fuse Plug Corporation will manufacture fuse plugs, having been chartered with $50,000 capital.

Following Newark concerns have been chartered:

Eagle Metal Products Company, sheet metal products, $125,000; **Art Metal Works, Inc.**, manufacture metal statuary, 100,000 shares common; **Gravity Separator and Equipment Company**, manufacture oil separators, $100,000; **Tri-State Tool Company**, manufacture tools, 2,000 shares no par; **Anderson Transmission Company, Inc.**, transmission equipment, 1,000 shares no par; **Union Chandelier Company**, manufacture lighting fixtures, $25,000; **Apco Chemical Company**, manufacture chemicals, 1,000 shares no par; **John F. Giles and Sons Company**, manufacture fountain pens, $25,000; **National Neon Tube Corporation**, manufacture special tubes, $25,000 preferred stock and 2,500 shares common; **Crowder Laboratories**, electroplating, $100,000; **Triangle Platinum Works, Inc.**, platinum, $100,000; **Mulberry Metal Stamping Works**, manufacture stamps, $10,000.—C. A. L.

Middle Western States

Detroit, Mich.

June 1, 1928.

The Gibbs Welding Machines Company at Bay City has recently installed an experimental laboratory for solving difficult problems in the electric welding of metals. Special equipment has been built and is now being used for welding of all cowls, gasoline tanks and fan blades for the **Ford Motor Company**.

Batteries are the latest addition to the long list of **General Motors** products. In Muncie, Ind., a plant for their manufacture has been acquired recently by this great organization. This new activity will come directly under the management of **Delco-Remy** subsidiary, whose headquarters are at Anderson, Ind.

Consolidated Brass Company has been incorporated at 139 Summit Street, Detroit. It has a capital stock of $50,000. The owners are Chesley McA. Evans, William E. Skinner, Jr., and Homer D. Coleman, all of Detroit.

Announcement is made that sales of the **C. M. Hall Lamp Company**, auto lamp manufacturers, for the first two months of 1928 were practically double those for the corresponding period in 1927. Sales in January amounted to $344,902, and in February to $387,142, a total of $732,044. A contract was signed not long ago calling for releases which will result in sales amounting to approximately $1,000,000 within the next twelve months to this single account.

Net profits of **Campbell, Wyant and Cannon Foundry Company** at Muskegon, for three months of 1928 amounted to $435,064, after charges and federal taxes.

The Pleasant Valley Brass Company, with headquarters at 907 Godfrey Avenue, Grand Rapids, was recently incorporated. The owners are Miner S. Keeler, C. Norman Webb and Earle S. Clark, all of Grand Rapids.

The McCord Radiator and Manufacturing Company reports net earnings after federal taxes for the first quarter of 1928 of $179,349. On March 31, 1928, current assets amounted to $3,490,042 against current liabilities of $942,602.

The Valley Castings and Pattern Company of Bay City will soon move parts of its equipment to the new addition now under construction, the third to be added since the plant was founded in 1923. The new unit will house the offices, pattern shop and the brass and copper foundry. This expansion means that the capacity of the brass foundry will be trebled. **William Mueller** is president and **Edward C. Smith** secretary and treasurer.

The first unit of the new and enlarged foundry being built by the **Detroit Gray Iron Foundry** has been completed. The second unit, which is now under construction, will be in operation in about 60 days, it is announced.

Toledo, Ohio

June 1, 1928.

Toledo is experiencing an unusual period of prosperity which, of course, includes to a great extent the plants engaged in the non-ferrous metal working. During the last year the 600 plants already in operation in various lines of industry expanded by more than 10 per cent and many spent between $10,000 and $2,000,000 on new buildings and equipment. This expansion program included many in the brass and copper and in the plating industries. Employment has steadily increased in all lines of industry. Toledo is entering the summer manufacturing period in fine shape and every indication is that present conditions will prevail for many months. Employment in 51 major plants shows a new high record for May with 39,025 engaged, against 31,833 a year ago. The majority of plants engaged on automobile accessories are working night shifts.

Negotiations have been completed for the consolidation of the **Electric Auto-Lite Company** of Toledo and the **U. S. A. Battery Corporation**, of Niagara Falls, according to Clem D. Minniger, president of the former. The deal involves $10,000,000 and will be carried out through an exchange of stock, it is stated. It is proposed that the Auto-Lite Company increase its common stock from 250,000 shares of no par stock now outstanding to 1,000,000 shares of no par value common stock, and that it authorized an issue of $10,000,000 of seven per cent preferred stock.

A new road lamp with a number of improvements has recently been offered to the motoring public by the **Seiss Manufacturing Company** at Toledo. The lamp has a ball-socket bracket and can be set at any angle and secured by a device that will not permit it to slip or twist. Road lamps are rapidly superseding the old spot-light. The Seiss company is now producing the new lamp in quantity, and recently made its first shipment.—F. J. H.

Cleveland, Ohio

June 1, 1928.

Practically all plants engaged in non-ferrous metal work are under fair production and in many instances even better than that. Some of them are employing night shifts. The plating industry is quite extensively engaged. Judging from present conditions and encouraging forecast, the metal industry in this territory will experience a fairly successful summer. As in the past, the motor car industry is sustaining many of the plants. This field is particularly active, with an encouraging outlook. Many accessory manufacturers are engaged on contracts for the Detroit motor plants. New car production is even more extensive now than it was a few weeks ago. The employment situation is about normal. More men are employed now than earlier in the season. —F. J. H.

Chicago, Ill.

JUNE 1, 1928.

Business conditions in the Chicago district as a whole continue to show improvement, although some slowing up has been evident in wholesale trade and furniture manufacturing. Metals and metal products, vehicles, stone, clay, lumber and automobile production all registered gains for April, and for May the metals, vehicles, and the seasonal increase in building construction seem to be sustaining the industrial labor market. The metal and metal products group (other than vehicles) continue to show an increase in the number of wage earners employed.

Wireless Dry Cell, Ltd., manufacturers of radio and all other types of dry cell batteries, have recently leased 50,000 square feet in the Crooks Terminal Warehouse in the Clearing Industrial District. This company, formerly located at Niagara Falls, New York, has moved all manufacturing, executive and sales offices to the Chicago location. They will employ about 500 men. Decision to move to Chicago was the result of a four-month study of various industrial cities in the middle west. Chicago was chosen, states **N. F. Folsom,** manager of the plant, because of its general distribution facilities, central location and the excellent package car service operating from Chicago to all points in the country. Previous to moving, increased production was carried on in the Niagara Falls plant to take care of business during the interval of removal. Despite this, the company has found it necessary to operate two shifts of workmen. **George H. Gooderman,** president and in control of the company financially, is a member of the Canadian parliament. Mr. Folsom, plant manager, states that their brief operating experience in Chicago has already proven their judgment correct in locating here.

The **Aviadon Committee** of The Chicago Association of Commerce, together with other aviation interests in Chicago and its metropolitan district, are giving consideration to a proposal that a tract of land of approximately one square mile in area be selected and utilized as a site for the location of airplane manufacturers. The plan contemplates suitable sites to be provided around the rim of such a field, leaving the center free for use by all manufacturers in testing their equipment. Considerable interest in the plan has been manifested but no definite site has been chosen as yet.—W. S. H.

The **Merit Metal Specialties Company** of Chicago was incorporated with a capital of $10,000 by Edward Kotas, William Galubke, Harry Schugert and Frank Nessing. The firm will manufacture metal specialties and mechanical devices.

The Caldwell Manufacturing Company, at Champaign, was incorporated with $25,000 capital by C. M. Caldwell, Harriet Caldwell and Vincent Manning. The firm will manufacture and deal in metal alloys, metals and metal products.

The John Kramer Alloy Corporation was formed recently by L. L. Becker, H. M. Korshak and Donald Korshak in Chicago, with a capitalization of $10,000. The firm will engage in mining and deal in alloys and metals of all kinds.—A. P. N.

Milwaukee, Wis.

June 1, 1928.

National Plating Company, Inc., reports a very successful period of business the past few months. Their plant is under steady production, most of the time working near capacity. Recently, the firm increased its capital stock from $50,000 to $75,000.

Badger Metal Products Company was incorporated by Russell W. Stambough, John K. Stambough and W. E. Browne. The capitalization was for $20,000. The firm will manufacture wood and metal products, dies, etc.

Geuder, Paeschke and Frey Company, tin iron and metal manufacturers, have lost their income and profits tax appeal involving $158,347 tax payments, it is reported from Washington, D. C. The board of tax appeals upheld Commissioner of Internal Revenue Blair in rejecting the company's plea. The Milwaukee firm had claimed that Commissioner Blair had erred in his tax collection figures for 1918, 1919, 1920.

The Wisconsin Knife Works, Clinton, Wis., is constructing a factory building at Beloit, Wis., which will cost about $15,000 when completed. The new building is 40 x 250 feet. The firm manufactures high-speed steel knives, carbon steel knives, molding blanks, and other such articles. P. G. Farrow is president of the firm, P. D. Westman, vice president; F. R. Weaver, treasurer and George C. Kruse, secretary.

The office force of the **West Bend Aluminum Company,** West Bend, Wis., is now functioning in the new quarters recently completed. A second story was added to one section of the building to afford more space for the office force. An experimental kitchen and general assembly room has been provided in a portion of the building formerly occupied as the office.

The Metal-Ware Corporation, whose plant and main offices are located at Two Rivers, Wis., has been adding new items to its line of products. Among the latest is the new Empire electric sandwich toaster, with patented expansion hinges. **The Metal-Ware Corporation** is also manufacturing a revolving miniature engine display stand, carrying the more important engines in the Empire line. Instead of providing this rotating power with the usual hidden motor, Metal-Ware sets out one of its miniature engines in plain view as the driving unit. The firm is also manufacturing an electric percolator with colored handles.

Announcement was made by the **Olsen Manufacturing Company,** owners of the plant formerly occupied by the Winther Motor Company, at Kenosha, Wis. of its plans for starting manufacturing operations soon. The announcement, made by **Lester L. Olsen,** one of the officials of the company, outlines the plans of the company to engage in the manufacturing of dies, jigs and fixtures, utilizing much of the machinery and supplies bought along with the plant several months ago. The **Olsen Manufacturing Company** is headed by **H. P. Olsen,** of Milwaukee, well known Milwaukee manufacturer and publisher.—A. P. N.

Other Countries

Birmingham, England

MAY 23, 1928.

The non-ferrous trades of Birmingham are fairly busy, although the demand of two or three months ago for copper and bronze tubes has scarcely been maintained. But the seasonal orders given out by the Admiralty are very well up to the average and the orders for copper tubes for water conveyance are gradually expanding, not only for home requirements but for several foreign countries and the Dominions. Competition from Germany, however, is still keen.

The makers of wireless apparatus have had a very busy season. The home demand is falling off a little but good orders are coming from India; Egypt is taking good supplies of apparatus; the Dutch

East Indies is a promising market. The Birmingham non-ferrous factories are very largely benefiting by the demand for wireless apparatus, and the importance of wireless as a branch of the brass and non-ferrous trades is being increasingly recognized.

The rapid extension of electric lighting has given many factories a busy season which has lasted very much longer than was expected. A large quantity of switch gear has been sold. Among the best markets are Australia, New Zealand and South Africa. The plate trade is rather quiet, but the hotel demand is becoming gradually more conspicuous. This is attributed very largely to the hotel business, which has been enormously stimulated by the great increase in motoring, which has given many a country hotel a new lease of life. The general activity of motor building has kept the casters of aluminum engine parts very busy. Makers of building and cabinet hardware of brass are still getting good orders from the builders, especially for the municipalities. Nigeria is taking large quantities of miscellaneous metal goods and improving business is being done with the West Indies, China and Central America, although there is keen competition with Germany and Czecho-Slovakia. The Government Overseas Department is keenly watching business possibilities of opening up new markets and a succession of exhibitions of foreign ware arranged by the Chamber of Commerce has had a very good effect in this direction.

A line which has developed a good deal lately relates to the reproduction of old Sheffield plate, designs of table hollow ware, trays and candlesticks, for which a demand has rather suddenly appeared from the United States and Canada. The firms possessing dies for such goods have received large orders.

The jewelry trade is on the whole maintaining the revival first noticeable last autumn, some reaction having taken place from the passion for spending money on motoring which was formerly devoted to jewelry. This is manifest chiefly in a liking for fairly good quality jewelry, not of the most expensive kind. The Birmingham jewelers continue also to compete more successfully with the gilt goods from the Continent. Orders for shipbuilding are slowly improving, some makers of door handles, knobs, etc., having got very good orders. The trade has been assisted to some extent by the Birmingham Chamber of Commerce, which has succeeded in getting reduced railway rates for the carriage of manufactured jewelry.—J. H.

Business Items—Verified

Dinsmore Plating Company, of Toledo, Ohio, has moved to Bryan, Ohio. The company does electroplating.

Paul M. Hooven Corporation announces that it has removed to more spacious quarters at 25-33 West Eighteenth Street, New York. Telephones are Chelsea 6915, 6916.

H. S. Hagert, Inc. 1923 Manning Street, Philadelphia, Pa., manufacturer of lighting fixtures and equipment, has plans for an addition, including alterations in its present factory.

Copperweld Steel Company, formerly of Rankin, Pa., has moved to its new modern mill covering 20-acres at Glassport, Pa. The main offices have also been removed from Rankin to Glassport.

Cribben and Sexton Company, Chicago, Ill., is installing a new Alundum V-bottom furnace, with special hanging rack equipment, supplied by **The Ferro Enamel Supply Company**, Cleveland, Ohio.

Abingdon Sanitary Manufacturing Company, Abingdon, Ill., plans to issue bonds to the amount of $500,000. Contrary to recent reports, the company will not enlarge its plant at this time.

Hamburg Plating and Manufacturing Company, 222 South Fourth Street, Hamburg, Pa., has opened a job shop for plating, polishing and lacquering. Operations started April 1, with **George H. Shappell** in charge.

Beam-O-Lite Sign Company, New York, has leased space in the building at 135 West Twenty-sixth Street, where it will manufacture display signs based on a new idea which lends the effect of illumination without electricity.

National Plating Company, Milwaukee, Wis., has increased its capital stock from $50,000 to $75,000 and is contemplating enlargement of its plant. The company operates plating, japanning, lacquering, polishing and grinding departments.

The Ashland Division of the **American Rolling Mill Company** has ordered three 300-horsepower oil-electric locomotives to be built jointly by the **Ingersoll-Rand Company**, **General Electric Company** and **American Locomotive Company.**

Loth Stove Company, Waynesboro, Va., will soon have in operation a new porcelain enameling department. Furnace will be electrically operated. Design and equipment were furnished by **The Ferro Enamel Supply Company**, Cleveland, Ohio.

Canada Brass Products, Ltd., plant at Merrickville, Ont., was totally destroyed by fire on March 16, 1928, with loss of $30,000. The plant has been practically rebuilt and will soon be in operation again, according to L. Payne, an official of the company.

The Northern Engineering Works, Detroit, Mich., makers of cranes and hoists, recently appointed **The Interstate Supply Company**, Commercial Trust Building, Philadelphia, as direct factory representative for the Philadelphia district. **W. H. Beyer** of the latter company is personally assuming charge of the account.

Ingersoll-Rand Drill Company, with offices at 314 North Broadway, St. Louis, Mo., was succeeded by Ingersoll-Rand Inc., on May 1, 1928. A new branch operating under the St. Louis office has just been opened at 226 West A Street, Picher, Oklahoma, to serve customers in northern Oklahoma, southern Missouri, and Arkansas.

George J. Mayer Company, Indianapolis, Ind., manufacturers of metal name plates, bronze tablets, embossed and etched signs, etc., is building an addition that will double its output. At present it plans to rearrange its equipment, but later new machinery will be purchased in order to care for the steadily growing needs of the company.

Botfield Refractories Company, Swanson and Clymer Streets, Philadelphia, Pa., wishes to announce that, effective June 1st, the distribution of their products, Adamant Fire Brick Cement, Adachrome and Adachrome Fines and the Adamant Gun for Toledo, Ohio and vicinity will be handled by The Builders & Industrial Supply Company, 4090 Detroit Street, Toledo, Ohio.

The Philadelphia Porcelain Company, Woodlynne, N. J., has been re-organized and plant will be completely revamped within a short time. The new officers are: R. A. Weaver, president; H. D. Cushman, vice-president; R. L. Williams, treasurer; R. A. Nelson, secretary and general manager. New furnace will be installed immediately and also special handling equipment.

Silverfill Manufacturing Company, Inc., Boston, Mass., recently formed by Howard P. Cobb and associates, with capital of $100,000, will operate a plant at Boston for the manufacture of a mechanical preparation in powder form for plating silver, nickel, brass, etc. The product is a chemical with a silver base. At present the company is having the substance made outside on contract.

American Signs Corporation, Kalamazoo, Mich., has just completed installation of a porcelain enameling department, which is complete and modern in every way. Enameling furnace is operated electrically with unusual large capacity, designed by **The Ferro Enamel Supply Company**, Cleveland. The department will be operated by A. E. Thomas. B. C. Wilson is vice-president and general manager of the company. T. H. Mars is general superintendent.

Ornamental Bronze Manufacturing Company has established a plant at Lancaster, Ohio, where it will manufacture lighting fixtures, cast bronze tablets, store fronts, etc., aluminum and other non-ferrous metal castings. Officers of the company are William H. Stuckney, president; B. W. Simpson, secretary; F. C. Spybey, treasurer. The following departments will be operated: brass, bronze and aluminum foundry; brass machine shop; polishing and lacquering rooms.

Keystone Aluminum Die Casting Company, 1134 South Cecil Street, Philadelphia, has been organized by William H. Brown and Frank Brown to operate a plant for the manufacture of aluminum die castings for utensils, automobile parts, etc. The company is capitalized at $50,000. It will operate automatic, pneumatic die casting machines. At

present it is in the experimental stage. The company would like to hear from producers of wooden handles for kitchen utensils.

Olsen Manufacturing Company, Kenosha, Wis., recently organized, will start operations on May 1 as a general machine shop, specializing in dies, jigs, fixtures, etc. The company occupies the plant previously used by the **Kenosha Fire Engine and Truck Company,** and before that by the **Winther Motor Truck Company,** and is headed by H. P. Olsen, Lester S. Olsen and Robert E. Bussian. Business is being started in a conservative manner. Trucks are not to be manufactured, but all kinds of repairing and rebuilding of motor trucks will be done and parts supplied. Contractors' equipment will also be repaired, and special machinery and equipment will be built to order. Later, the company will put out a line machinery and equipment.

Review of the Wrought Metal Business

By J. J. WHITEHEAD,

President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

JUNE 1, 1928.

Prices for all fabricated brass and copper products were advanced during May, following the rise in the price of ingot copper. It is felt that these prices are likely to hold for some time because of the strength in the copper market, and as the result of this belief there was a considerable amount of buying on the part of consumers. It is fairly evident, however, that the element of speculation has not entered to any great extent, and that most of the buying was for reasonable requirements during the next month or two. This reluctance on the part of buyers to speculate, together with the hand-to-mouth purchasing policy which has been the vogue for some time, has kept the industry in a healthy condition. Very few large stocks are being carried by consumers or dealers, and as a result the mills have been kept busy with a steady flow of orders, making for a continuous operation without any spotty periods.

Building operations having been resumed on a large scale; the demand for sheet copper and brass pipe has continued to increase rapidly. Practically all the specifications for buildings in the eastern cities and suburbs, from the largest skyscrapers down to small homes are now being written to include the use of copper flashings, leaders and gutters for the roofing work and brass pipe for plumbing. This has carried with it a demand for a non-rusting hot water heater and storage tank. The owners of buildings and homes have been educated to the use of brass pipe, to insure a clean water supply. They have now begun to see the inconsistency of incurring the expense of installing brass pipe to insure freedom from rust, and connecting the brass pipe to an iron storage tank which will produce the very rust they have set out to avoid. Manufacturers of copper boilers, realizing the advantage of developing a hot water heating unit made entirely of copper and brass at a low price, have concentrated their efforts along these lines with the result that it is now possible to secure a combination instantaneous and storage tank, insuring a constant supply of clean hot water at a price not very much higher than the cost of the old style iron unit. The low price of the copper tanks has been made possible by a new economical heating system, and quantity production, which in turn has been stimulated to meet the increased demand.

Speculative home builders are beginning to understand the value of copper boilers, as an advertising feature, and an added appeal to the prospective purchaser.

Following the installation in the New York Life Insurance Company building, of five copper boilers, each having a capacity of 1,000 gallons, the City Club of Boston, Mass., has placed an order for two copper boilers of the same capacity to replace the iron boilers that have been in use for only a few years and have rusted out.

Producers of sheet and tube in the white metal, copper nickel alloys are extremely busy. Some very heavy tonnages of Monel metal have been installed during the past month or two in hotel and restaurant equipment. The Longchamp chain of restaurants has equipped five large kitchens with Monel metal and the new Hotel Lincoln in New York City is completely equipped with Monel metal, both in the main kitchens and all service pantries. Very large contracts for Monel metal were placed during May, for the New York Life Insurance Company building, the Equitable Trust Company, in New York, and the Fidelity Trust Company and Girard College in Philadelphia.

Business of this character together with the seasonal demand from the refrigeration industry has combined to keep the order books of the producers at a record high level.

Metal Market Review

By R. J. HOUSTON,

D. Houston & Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

JUNE 1, 1928.

Active market operations at advancing prices, a steadily improving statistical position and huge deliveries into consumption are definite indications of the underlying strength of the copper situation. May displayed pronounced firmness and closed at 14¾ cents a pound delivered to Connecticut Valley points, a gain of 2⅛ cents a pound since the end of May, 1927.

Consumers at home and abroad bought freely and business was maintained at a consistently high level. Orders flowed in at a rapid rate and for large volume tonnage as the market developed an upward tendency. Foreign interest was a powerful factor at all times and had much to do in stimulating buying for domestic account. European consumers are vitally dependent upon shipments from this country. This is specially apparent since stocks abroad have shrunk to small proportions, while consumption is expanding.

Favorable developments are making themselves felt. The metal appears to be entering an era of more stability. One of the best evidences of this is found in the reduction of surplus stocks and the adjustment of production in line with sound economic conditions.

Nearby delivery is scarce and the tone of market strong at 14¾ cents domestic shipment and 15 cents c.i.f. European ports.

ZINC

The zinc market recovered from some of its depression lately. Again sellers were more conservative in their offerings and consumers were buyers on a fairly good scale. Prices of Prime Western Slab zinc advanced from 5.87½ cents to 6.12½ cents East St. Louis. Demand did not seem to broaden out strongly enough to bring about vigorous buying generally. The firm undertone, however, reflects the reserve of sellers and an advance to $40 per ton in the zinc ore market. Recent sales of ore at this level were in heavy volume, and the effect has been to steady the entire situation. Stocks of slab zinc in smelters hands on May 1 amounted to 44,759 tons, against 41,529 tons on April 1, an increase of 3,230 tons. Domestic deliveries fell off 5,339 tons, but despite the less favorable statistics the market held up and subsequently improved owing to a firmer selling policy.

TIN

For several consecutive weeks tin has hovered around comparatively low range prices. There was an absence of the wide fluctuations for which the tin market has hitherto been noted. Meantime a fair degree of stability has prevailed, but in the last half of the month Straits tin sold down to 51¼ cents for May delivery and at 50⅝ cents for June. These quotations compare with a low of 56⅛ cents and a high of 71 cents in 1927.

There has been a great deal of caution shown by both sellers and buyers. Professional manipulation lacks the energetic drive usually associated with the tin market. The statistical position, however, is looked upon as substantially sound, although trade sentiment has been affected by increased production and heavier shipments of Straits tin. Consumers were active buyers during last half of May and dealers also were fairly interested in the transactions. Sales in the Far East were on a large scale and attracted special attention. The local market at this writing is quiet and quotable at 50⅝ cents to 50.80 cents for Straits tin deliverable in June.

LEAD

The general tone of the lead market remained steady most of the past month with moderate buying on the basis of 6 cents St. Louis and 6.10 cents New York. These prices had been in effect from April 2 to May 25 when the leading producer advanced its price to 6.20 cents New York. Consuming demand became more active on signs of market strength, but thus far it has not developed into a broad and general buying movement. Lead has gone through a long period of comparatively low prices. Better statistics have had a favorable influence on sentiment.

ALUMINUM

Demand for aluminum continues in large volume and appears to amply justify the firm market which prevails. The automotive industry, the rapid developments in the aircraft field and requirements for new uses combine to furnish extensive outlets for production. Imports of the metal have also decreased. The importations of foreign aluminum in the first quarter of this year amounted to 5,959,450 pounds as against 16,589,297 pounds in the first quarter of 1927, a decrease of 10,629,847 pounds. Bonded stocks of aluminum decreased 2,186,707 pounds in March. On April 1 stocks in bond amounted to only 8,078,171 pounds and were the smallest in seven months. Market prices are firm at 24.30 cents for 99% plus and 22.30 cents for 94% plus.

ANTIMONY

Transactions in antimony were on a moderate scale during May, and for a time the market stiffened slightly on the war reports from China. Some business was placed at 11⅜ cents for June and July arrival. The situation developed irregular features later in the month and sales were made at receding prices. Trading was rather quiet at end of month and the market narrow. More activity is expected in sympathy with the firmer lead market. Chinese offers recently indicated considerable firmness in the Far East, but local quotations were 10¾ cents to 10⅞ cents for spot and futures duty paid.

QUICKSILVER

A fair inquiry was reported for quicksilver but recent sales were not particularly active. Market was quoted at $123.50 to $125.50 a flask. Small lots have changed hands at the higher price, but activity was confined to small transactions. Quicksilver stocks in bonded warehouses at end of March amounted to 409,913 pounds.

PLATINUM

Market quotations for platinum have moved in a narrow range lately. Present price of the refined metal is $76 per ounce.

SILVER

A strong upward movement in the silver market set in during the past month which sent prices to 63⅝ cents on May 24 which compared with 58½ at the beginning of the month. China and India figured as heavy buyers and the Far East orders stimulated the market into activity and strength. Chinese selling, however, brought about a reaction and checked the advancing tendency. At this writing the price of bullion has dropped to 61⅝ cents per ounce. A sudden change of speculative tactics by Chinese speculators has created considerable uncertainty as regards future movements. Shanghai stocks on May 17 were 106,989,000 taels.

OLD METALS

The advance in the market for new refined copper was reflected in firmer prices for all grades of scrap copper. Domestic consumers have been more ready buyers and fairly good quantities have changed hands on a rising market. Foreign consumers were also more eager to secure shipments for export. There is a fairly good demand for selected material. The brass grades are also somewhat firmer as the result of the stronger tone noted for virgin copper. Buying prices quoted by dealers were 13¼ cents to 12½ cents for crucible copper, 10½ cents to 10¾ cents for light copper, 7¼ cents to 7½ cents for heavy brass, 6¼ cents to 6½ cents for light brass, 9 cents to 9¼ cents for new brass clippings, 4¾ cents to 5 cents for heavy lead, 3 cents to 3¼ cents for old zinc, and 17 cents to 17½ for aluminum clippings.

Daily Metal Prices for the Month of May, 1928

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	14	15	16	17
Copper c/lb. Duty Free													
Lake (Delivered)	14.375	14.375	14.375	14.375	14.375	14.375	14.375	14.375	14.375	14.50	14.50	14.50	14.50
Electrolytic (f. a. s. N. Y.)	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.35	14.35	14.375	14.40	14.45	14.45
Casting (f. o. b. N. Y.)	14.00	14.00	13.95	13.95	13.95	13.95	14.00	14.00	14.00	14.10	14.125	14.125	14.20
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	5.875	5.875	5.875	5.875	5.95	5.975	6.00	6.00	6.00	6.10	6.10	6.075	6.10
Brass Special	5.925	5.925	5.925	5.925	6.00	6.025	6.05	6.05	6.05	6.15	6.15	6.125	6.15
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	51.125	51.375	51.875	51.625	51.125	51.375	51.875	52.00	52.00	52.125	52.50	52.25	51.75
Pig 99%	50.75	51.125	51.625	51.375	50.75	51.125	51.625	51.75	51.50	51.375	51.875	51.75	51.375
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	37	37	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	10.375	10.375	10.50	10.75	11.25	11.125	11.375	11.375	11.25	11.125	11.00	11.00	11.00
Silver c/oz. Troy Duty Free	58.50	58.375	58.375	58.50	58.75	59.125	59.75	59.75	59.25	59.625	60.00	59.75	60.00
Platinum $/oz. Troy Duty Free	76.50	76.50	76.50	76.50	76.50	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00

*Holiday.

	18	21	22	23	24	25	28	29	*30	31	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Delivered)	14.625	14.625	14.625	14.625	14.75	14.875	14.875	14.875	.....	14.875	14.875	14.375	14.551
Electrolytic (f. a. s. N. Y.)	14.50	14.50	14.55	14.55	14.60	14.80	14.80	14.80	.....	14.80	14.80	14.30	14.472
Casting (f. o. b. N. Y.)	14.25	14.125	14.125	14.15	14.20	14.25	14.25	14.35	.....	14.50	14.50	13.95	14.116
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.075	6.15	6.15	6.125	6.125	6.15	6.15	6.15	.....	6.15	6.15	5.875	6.047
Brass Special	6.125	6.20	6.20	6.175	6.175	6.20	6.20	6.20	.....	6.20	6.20	5.925	6.097
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	51.75	51.275	51.50	51.625	51.625	51.375	51.125	50.625	.....	49.875	52.50	49.875	51.540
Pig 99%	51.375	50.875	50.875	51.125	51.125	51.00	50.875	50.50	.....	49.50	51.875	49.50	51.148
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.00	6.00	6.00	6.00	6.00	6.10	6.10	6.175	.....	6.20	6.20	6.00	6.026
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	.....	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb													
Ingot	35	35	35	35	35	35	35	35	.....	35	35	35	35
Shot	36	36	36	36	36	36	36	36	.....	36	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	.....	37	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	11.00	11.00	11.00	11.00	10.875	10.875	10.875	10.625	.....	10.625	11.375	10.375	10.926
Silver c/oz. Troy Duty Free	60.875	62.25	62.25	62.875	63.625	62.625	61.625	61.438	.....	60.875	63.625	58.375	60.372
Platinum $/oz. Troy Duty Free	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00	.....	76.00	76.50	76.00	76.114

Metal Prices, June 4, 1928

NEW METALS

Copper: Lake, 14.87½. Electrolytic, 14.75. Casting, 14.50.
Zinc: Prime Western, 6.15. Brass Special, 6.20.
Tin: Straits, 49.55. Pig, 99%, 49.125.
Lead: 6.20. **Aluminum,** 24.30. **Antimony,** 10.50.

Nickel: Ingot, 35. Shot, 36. Elec. 37. Pellets, 40.
Quicksilver: flask, 75 lbs., $124.50. **Bismuth,** $2.10.
Cadmium, 75. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 60.25.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $76.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11¼
Brass Ingots Red	12 to13½
Bronze Ingots	12½to16
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	24 to40
Manganese Bronze Ingots	12½to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	14 to15
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17 to20
Phosphor Tin, no guarantee	60 to70
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%.....according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
12¼to12¾	Heavy Cut Copper	13¾to14
12 to12½	Copper Wire	13 to13¼
10 to10½	Light Copper	11¾to12¼
10 to10¼	Heavy Machine Composition	11 to11½
7¾to 8	Heavy Brass	9¼to 9½
6½to 6¾	Light Brass	8 to 8¼
7¾to 8	No. 1 Yellow Brass Turnings	9¼to 9¾
9¼to 9½	No. 1 Composition Turnings	10¾to11
5½to 5¾	Heavy Lead	6¾to 7
3½to 3¾	Zinc Scrap	4¾to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17½to18½
19 to20	Scrap Aluminum, sheet (new)	22 to22½
35 to37	No. 1 Pewter	41½to43½
11½	Old Nickel Anodes	13½
17½	Old Nickel	19½

Wrought Metals and Alloys

COPPER SHEETS

Mill shipment (hot rolled)	23½c. to 24½c. net base
From Stock	24½c. to 25½c. net base

BARE COPPER WIRE

16⅜c. to 16⅝c., net base, in carload lots.

COPPER SEAMLESS TUBING

25c. to 26c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	22c. net base
100 lbs. to 200 lbs. in one order	22½c. net base

ZINC SHEET

	Cents per lb.
Duty sheet, 15%	
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	9.00 net base
Casks, jobbers' price	9.50 net base
Open casks, jobbers' price	10.00to 10.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	33.30c.-36.50c.
Aluminum coils, 24 ga., base price	31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 62½c. to 64½c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect May 25, 1928
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.19¼	$0.20¾	$0.22¾
Wire	.19¾	.21¼	.23¼
Rod	.17	.21½	.23½
Brazed tubing	.27¼	....	.32½
Open seam tubing	.27¼	....	.32½
Angles and channels	.30¼	....	.35½

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅝c. to 24⅝c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19¼c. net base
Muntz or Yellow Rectangular sheet other Sheathing	20¼c. net base
Muntz or Yellow Metal Rod	17¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	27 c.	10% Quality	30 c.
15% Quality	28½c.	15% Quality	33¾c.
18% Quailty	29¾c.	18% Quality	37 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, June 4, 1928

ANODES

Copper: Cast	21½c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled, oval	21⅝c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	22⅝c. per lb.	99%	49c. per lb.
Brass: Cast	22½c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 60¼ to 62¾c., Troy ounce, depending upon quantity.	
Zinc: Cast	12 c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.	
12" 20 ply 64/68 Unbleached	$31.00
14" 20 ply 64/68 Unbleached	39.95
12" 20 ply 80/92 Unbleached	33.05
14" 20 ply 80/92 Unbleached	44.80
12" 20 ply 84/92 Unbleached	42.50
14" 20 ply 84/92 Unbleached	57.60
12" 20 ply 80/84 Unbleached	38.35
14" 20 ply 80/84 Unbleached	52.00
Sewed Pieced Buffs, per lb., bleached	45-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.13-.17
Acid—Boric (Boracic) Crystals	lb.	.09½
Chromic, 75 and 125 lb. drums	lb.	.21-.25
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¾-.22¼
Denatured, drums	gal.	.44-.52
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16-.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.06
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry, bbls.	lb.	.29
Chloride, bbls.	lb.	.18
Salts, single, 300 lb. bbls.	lb.	.10½
Salts, double, 425 lb. bbls.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.49½-.54¼
Cyanide (fluctuating)	oz.	.57-.66
Nitrate, 100 ounce lots	oz.	.42¾-.41½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.19
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.35
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38½-.39½
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.10½-.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¾